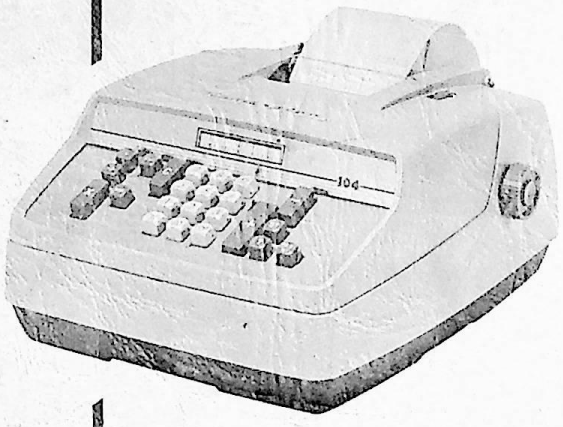
REMINGTON®
MODEL 104
CALCULATOR

INSTRUCTION MANUAL



Remington OFFICE MACHINES
DIVISION OF SPERRY RAND CORPORATION
SPERRY RAND BLDG. - NEW YORK, N.Y. 10019

DM-228

INSTRUCTION MANUAL

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SPERRY RAND BUILDING
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MODEL 104 CALCULATOR

REEL NO. 1

SIDE NO. 1

DIGIT KEYS 1 THRU 9	000
ZERO KEYS	117
DIGIT KEY MOTOR TRIP	268
QUESTIONS AND ANSWERS	340
LIST UNIT	448
LIST UNIT FORWARD & RETURN STROKE ACTUATOR HOOKS	545
LIST UNIT RESET MECHANISM	665
QUESTIONS AND ANSWERS	760
EXAMINATION NO. 1 (SEE INSTRUCTOR)	

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MOTOR AND GOVERNOR	157
CORRECTION OPERATION	231
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SIDE NO. 1

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QUESTIONS AND ANSWERS	575
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ACCUMULATOR UNIT	635

SIDE NO. 2

ACCUMULATOR UNIT CONT'D	000
QUESTIONS AND ANSWERS	625

REEL NO. 3

SIDE NO. 1

2986 2989
304 307

PRINTER UNIT	000
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DECIMAL PRINTING	230
QUESTIONS AND ANSWERS	275

RIBBON FEED	295
QUESTIONS AND ANSWERS	445
CARRIAGE	485
QUESTIONS AND ANSWERS	565
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SIDE NO. 2

MULTIPLY UNIT AND COUNTER CONT'D	000
QUESTIONS AND ANSWERS	135
MULTIPLICATION	210

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SIDE NO. 1

MULTIPLICATION CONT'D	000
QUESTIONS AND ANSWERS	350
DIVISION	535

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SIDE NO. 1

DIVISION CONT'D	000
QUESTIONS AND ANSWERS	300
STOP KEY OPERATION - MULT. AND DIVISION	440
QUESTIONS AND ANSWERS	530
DECIMAL KEY OPERATION - MULT. AND DIVISION	545
QUESTIONS AND ANSWERS	690
MULTIPLY SUB-TOTAL KEY OPERATION	715
QUESTIONS AND ANSWERS	785
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UNITS REMOVAL (TOP PLATE)	810

SIDE NO. 2

UNITS REMOVAL (TOP PLATE CONT'D AND LIST UNIT)	000
UNITS REMOVAL (ACCUMULATOR UNIT)	060
UNITS REMOVAL (RECALL UNIT)	115
ADJUSTMENTS 1-27	135

REEL NO. 6

SIDE NO. 1

ADJUSTMENTS 28-42	000-240
EXAMINATION NO. 5 (SEE INSTRUCTOR)	

FOREWORD

THIS INSTRUCTION MANUAL IS INTENDED PRIMARILY FOR MECHANICS; IT IS NOT AN OPERATOR'S INSTRUCTION MANUAL AND SHOULD NOT BE GIVEN TO CUSTOMERS.

THE DRAWINGS CONTAINED IN THIS MANUAL SHOULD BE STUDIED IN CONNECTION WITH THE WRITTEN INSTRUCTIONS AND ARE OF GREAT ASSISTANCE IN LEARNING THE FUNCTIONS AND ADJUSTMENTS OF THE VARIOUS MECHANICAL UNITS.

FOR THOSE IN THE FOREIGN FIELD WHO DO NOT READ ENGLISH, A CAREFUL STUDY OF THE DRAWINGS WILL GIVE HELPFUL FUNDAMENTAL INFORMATION.

TO OBTAIN BEST RESULTS, COMPLETE THEORY ON ONE SECTION AT A TIME, AFTER WHICH, REFER TO THE "ADJUSTMENT MANUAL" AND LEARN ADJUSTMENTS PERTAINING TO THIS SECTION. REPEAT THIS OPERATION UNTIL ALL SECTIONS HAVE BEEN COVERED.

MODEL 104 PRINTING CALCULATOR

INSTRUCTION MANUAL

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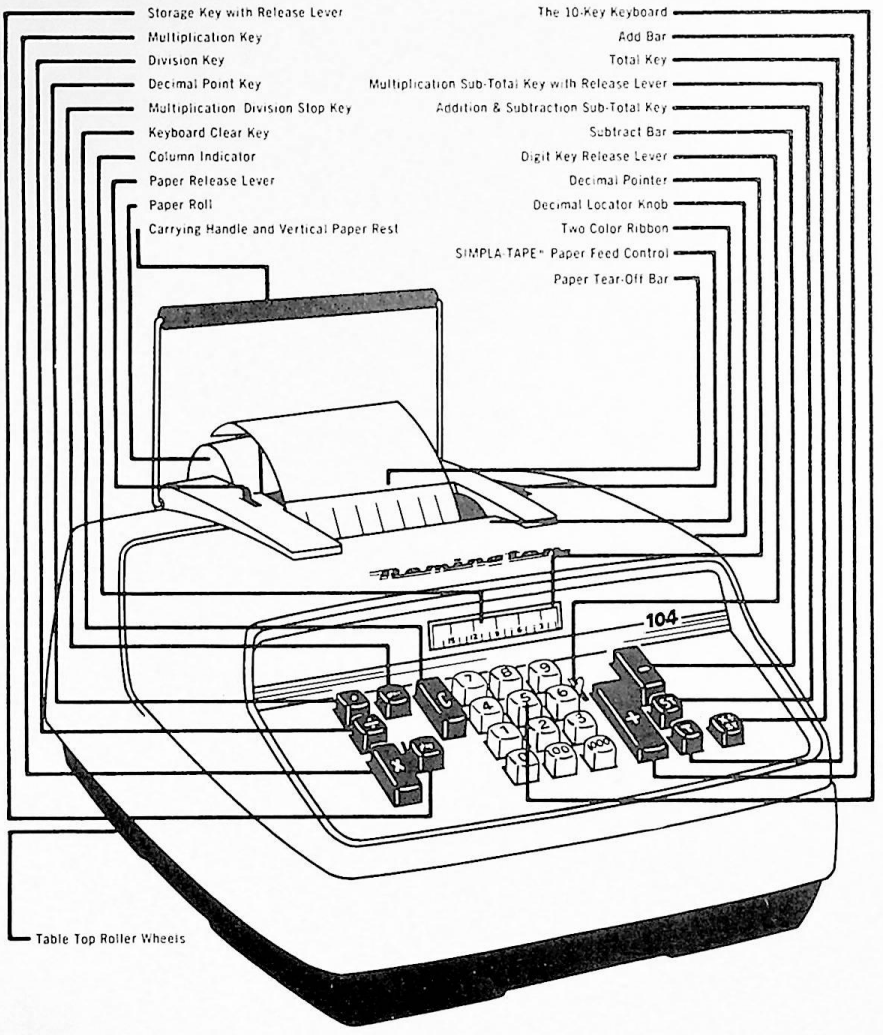
WHAT THE PRINTED SIMPLA-TAPE® SYMBOLS MEAN

+ *Added Item*
– *Subtracted Item*
S *Sub-Total Symbol, all functions*
T *Total*
o *Remainder in Division, if any*
o *Indicates cycling is complete*
: *Division Symbol*
X *Multiplication*

KEYBOARD & CONTROL FEATURES



Model 104 Printing Calculator

INTRODUCTION

The Model 104 Printing Calculator was engineered, developed and designed to SIMPLIFY and SPEED UP every phase of calculating machine operation. To develop this AUTOMATIC PRINTING CALCULATOR, the laboratory has spared no expense.

Even after the laboratory finished developing the "104", the factory has spared no expense in purchasing and in producing the finest precision tools and dies in order that the parts that go into this "104 Printing Calculator" will be held to closer tolerances than ever before heard of in office equipment manufacturing.

Precision made parts mean quality built right into the product. This means less down-time, fewer adjustments necessary and a general over-all saving to Remington as well as to our customers. Below are a few of the important improvements incorporated in this machine. (See illustration on opposite page)

I. Automatic Multiplication
II. Automatic Division
III. Decimal Point Key
IV. Storage Key
V. Recall Unit
VI. Multiply and Division Sub-Total Key
VII. Multiply and Division Stop Key
VIII. Correction Key

I. Automatic Multiplication

Automatic multiplication is performed in the following manner: Enter the multiplier in the keyboard and depress the multiply key. Enter multiplicand in the keyboard and depress the multiply key. The answer will be printed automatically and the machine will be clear and ready for the next operation. NOTE: For faster machine operation, enter the smallest number first.

INTRODUCTION (CONT'D)

II. AUTOMATIC DIVISION

AUTOMATIC DIVISION IS PERFORMED IN THE FOLLOWING MANNER: ENTER THE DIVIDEND IN THE KEYBOARD AND DEPRESS DIVIDE KEY. ENTER DIVISOR IN KEYBOARD AND DEPRESS DIVIDE KEY. IT SHOULD BE NOTED THAT DIVISOR IS AUTOMATICALLY ALIGNED WITH DIVIDEND ON SECOND DEPRESSION OF DIVIDE KEY. TO OBTAIN A QUOTIENT OF DESIRED SIZE, IT WILL BE NECESSARY TO ADD ZEROS TO THE RIGHT OF DIVIDEND.

III. DECIMAL POINT KEY

THE DECIMAL POINT KEY IS USED ONLY WHEN A DECIMAL IS CALLED FOR IN MULT OR DIVISION TO PLACE PROBLEM RESULT IN THE PROPER COLUMN. IT SHOULD BE NOTED THAT DECIMAL POINT KEY DOES NOT CONTROL PRINTING OF DECIMAL BUT ONLY EXTENDS PROBLEM TO TAKE A DECIMAL.

IV. STORAGE KEY

THE STORAGE KEY IS USED IN CONJUNCTION WITH RECALL UNIT TO RETAIN DESIRED FIGURE(S) IN MACHINE FOR FUTURE USE. STORAGE KEY IS DEPRESSED AFTER ENTERING AND LISTING A DESIRED FIGURE(S) IN MACHINE. STORED FIGURE CAN BE RECALLED AT ANYTIME BY DEPRESSING THE ADD, SUBTRACT OR MULTIPLY KEY. STORAGE KEY IS RELEASED BY ACTUATING STORAGE KEY RELEASE LEVER.

V. RECALL UNIT

THE RECALL UNIT IS BASICALLY USED TO RETAIN LAST PERTINENT PRINTED INFORMATION OR IT MAY BE USED TO STORE ANY PRINTED INFORMATION THROUGH THE USE OF STORAGE KEY. RECALL UNIT IS ALSO USED TO REPEAT AN ITEM SIMPLY BY DEPRESSING THE ADD OR SUBTRACT KEY UNLESS STORAGE KEY IS LATCHED. THE RECALL UNIT WILL BE EXPLAINED LATER IN THE TEXT OF THIS MANUAL.

VI. MULTIPLY AND DIVISION SUB-TOTAL KEY

THIS KEY IS USED TO OBTAIN AN AUTOMATIC SUB-TOTAL AFTER A MULTIPLICATION OR DIVISION PROBLEM. THIS KEY MUST BE DEPRESSED BEFORE THE FIRST DEPRESSION OF MULTIPLICATION OR DIVISION KEY. KEY IS RELEASED BY ACTUATING THE MULTIPLY AND DIVISION KEY RELEASE LEVER.

VII. MULTIPLY AND DIVISION STOP KEY

IN CASES WHERE IT IS DESIRED TO CLEAR THE MACHINE BEFORE THE PROBLEM IS COMPLETED, DEPRESS STOP KEY AT ANY DESIRED TIME WHICH WILL CAUSE MACHINE TO CLEAR AND AUTOMATICALLY STOP.

STOP KEY IS ALSO USED TO STOP MACHINE IN THE EVENT MACHINE HAS GONE INTO OVER CAPACITY AND IS CONTINUOUSLY RUNNING.

VIII. CORRECTION KEY

THE CORRECTION KEY IS USED TO CLEAR AN ERRONEOUS ENTRY IN MACHINE ON ADD, SUBTRACT, MULTIPLY OR DIVISION.

1. DIGIT KEYS

1.1

MACHINE NORMAL, LIST UNIT (10) (PLATE 1) WILL BE TO THE RIGHT WITH FIRST UPPER LEFT WHEEL (14) MESHED WITH LIST UNIT GEAR LOCATOR WHEEL (5) ON RIGHT END OF LIST UNIT CONTROL SHAFT (4). LIST UNIT CONTROL SHAFT (4) IS HELD IN ZERO POSITION BY EXTENSION "C" ON LIST UNIT CONTROL SHAFT LIMIT (3) LATCHED WITH EXTENSION "A" ON SHAFT (4). AS DIGIT KEY ONE THRU NINE IS DEPRESSED, DIGIT KEYLEVER (23) WILL BE ROTATED, PIVOTING LIST UNIT CONTROL SHAFT LIMIT BAIL (20), RELEASING LIST UNIT SHAFT LIMIT (3) FROM EXTENSION "A". LIST UNIT CONTROL SHAFT (4) WILL ROTATE CLOCKWISE, THROUGH PRETENSION COIL SPRING IN LIST UNIT CONTROL SHAFT SPRING HOUSING (25) ON LEFT END OF SHAFT (4) UNTIL EXTENSION "B" LIMITS ON FINGER "F" OF ESCAPEMENT BAIL DOG (24). THIS ACTION ROTATES LIST UNIT UPPER GEAR (14) COUNTERCLOCKWISE AND LOWER GEAR (14) CLOCKWISE SAME NUMBER OF SPACES AS THE VALUE OF KEY DEPRESSED. ALSO, AS LIST UNIT CONTROL SHAFT (4) ROTATES, DIGIT KEY LOCK BAR CONTROL LINK (7) MOVES REARWARD, CONTACTING OUTER DIGIT KEY LATCH BAR (8) AND, THROUGH COMPRESSION SPRING "E", LATCHES INNER DIGIT KEY LATCH BAR (18) OVER DIGIT KEYLEVER (23), LATCHING DIGIT KEY DOWN. AS EXTENSION "B" ON SHAFT (4) CONTACTS FINGER "F", ESCAPEMENT BAIL DOG (24) WILL BE CAMMED UPWARD, ROTATING ESCAPEMENT BAIL (19), RELEASING ESCAPEMENT FINGER (21) FROM ESCAPEMENT RACK (1). THIS PERMITS LIST UNIT (10) TO ESCAPE PARTIALLY TO THE LEFT UNTIL NEXT GEAR (12) LIMITS ON SIDE OF LIST UNIT LOCATOR GEAR (5). AT THIS TIME, LIST UNIT GEAR (14) THAT WAS ROTATED, WILL BE OUT OF MESH WITH LIST UNIT LOCATOR GEAR (5) AND LOCKED IN POSITION BY LIST UNIT UPPER LOCK PLATE (27) (FIGURE 1). AS LIST UNIT ESCAPES TO LEFT, DIGIT KEY RELEASE RACK (13) WILL ACTUATE KEY RELEASE ASSEMBLY (6), UNLATCHING INNER DIGIT KEY LATCH BAR (18) FROM DIGIT KEYLEVER (23), PERMITTING LEVER TO LATCH WITH OUTER DIGIT KEY LATCH BAR (8). THIS ALLOWS ESCAPEMENT BAIL (19) AND LIST UNIT CONTROL SHAFT LIMIT BAIL (20) AND LIST UNIT CONTROL SHAFT LIMIT (3) TO RESTORE TO NORMAL. AT THIS TIME, FINGER "F" OF ESCAPEMENT BAIL DOG (24) RELEASES FROM EXTENSION "B" ON LIST UNIT CONTROL SHAFT (4), ALLOWING SHAFT TO ROTATE TO NORMAL OR ZERO POSITION; ALLOWING DIGIT KEY LOCK BAR CONTROL LINK (7) AND OUTER DIGIT KEY LATCH BAR (8) TO MOVE FORWARD, UNLATCHING DIGIT KEYLEVER (23), PERMITTING DIGIT KEY (22) TO RESTORE. NOTCH "D" IN LIST UNIT LOCATOR GEAR (5) PERMITS LIST UNIT GEAR (12) TO MESH WITH LOCATOR GEAR (5), PROVIDING SECOND STEP ESCAPEMENT OF LIST UNIT.

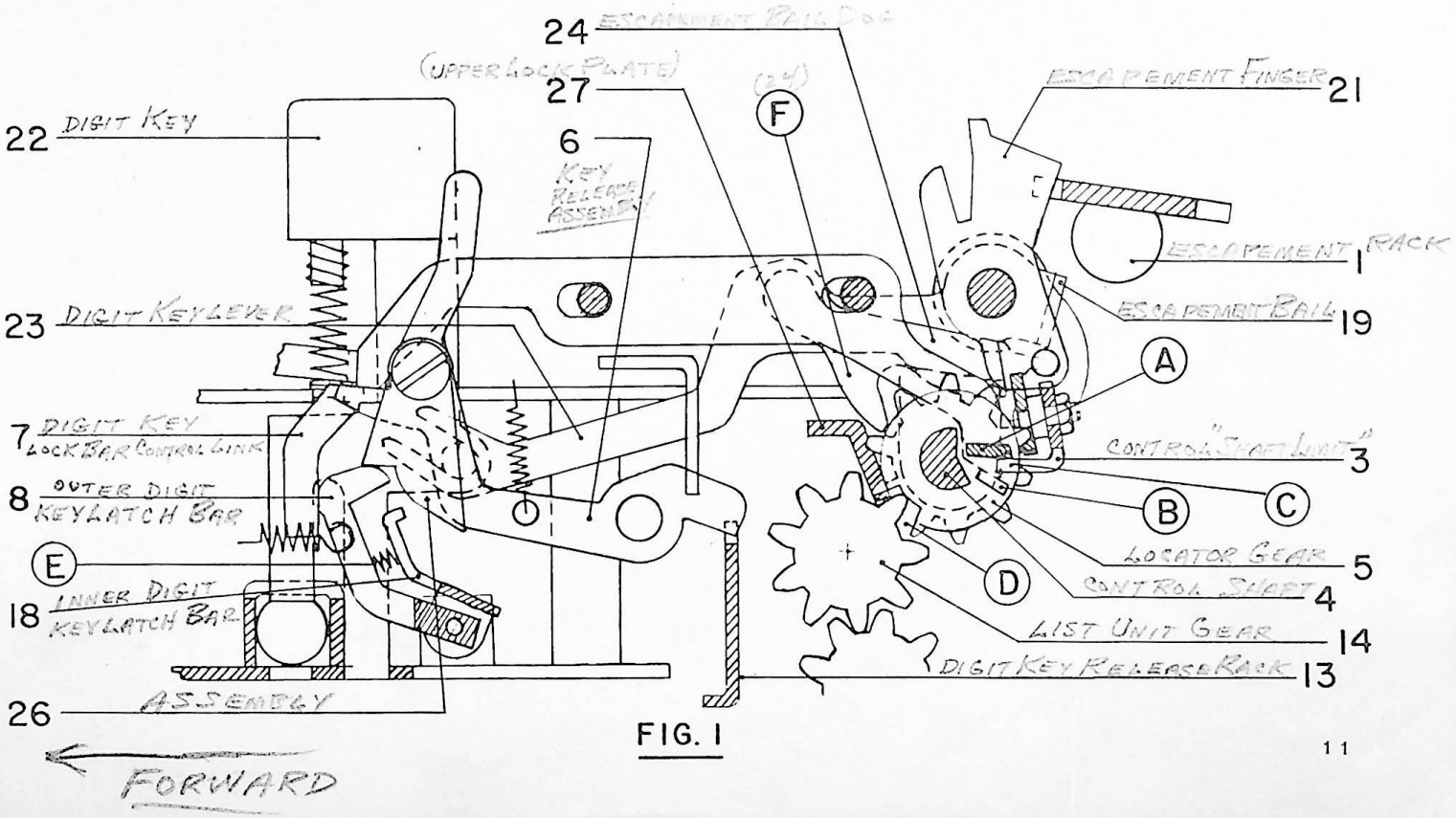


FIG. 1

1.2 ZERO KEYS - SINGLE, DOUBLE AND TRIPLE

DEPRESSION OF THE SINGLE ZERO KEY (11) CAUSES STUD (11A) TO CONTACT ARM (12) WHICH ROTATES BAIL (8) AND THROUGH ARM (7) AND ECCENTRIC (6) MOVES LINK (5) REARWARD. THROUGH STUD (5A) AT REAR OF LINK (5), ESCAPEMENT FINGER (3) WILL BE DISENGAGED FROM ESCAPEMENT RACK (4). ALSO, LINK (13) CONNECTED TO ARM (12) WILL BE MOVED REARWARD. THROUGH EXTENSION "D" OF LINK (13), HALF-STEP YOKE (2) WILL BE ENGAGED WITH THE ESACPEMENT RACK (4). THIS PERMITS ESCAPEMENT RACK (4), HALF-STEP YOKE (2) AND LIST UNIT TO PARTIALLY ESCAPE TO THE LEFT UNTIL HALF-STEP YOKE (2) LIMITS ON EXTENSION "C" OF LIMIT LINK (1). AS SINGLE ZERO KEY (11) RESTORES, ARM (12), BAIL (8) AND ARM (7) WILL RESTORE. LINK (5) WILL MOVE FORWARD TO ENGAGE ESCAPEMENT FINGER (3) THROUGH SPRING TENSION WITH ESCAPEMENT RACK (4). LINK (13) WILL MOVE FORWARD TO ALLOW YOKE (2) TO RESTORE UNDER SPRING TENSION FROM ESCAPEMENT RACK. THIS PERMITS LIST UNIT TO COMPLETE THE ESCAPEMENT. DEPRESSION OF DOUBLE ZERO KEY (10) THROUGH RIGHT STUD (10A) ON KEYSTEM ENTERING SLOT IN ARM (15) CAUSES ARM (15) TO CONTACT EXTENSION (8B) OF BAIL (8) WHICH WILL ROTATE BAIL (8) AND, THROUGH ARM (7) AND ECCENTRIC (6), MOVES LINK (5) REARWARD TO DISENGAGE ESCAPEMENT FINGER (3) FROM ESCAPEMENT RACK (4). THROUGH ARM (12), LINK (13) MOVES REARWARD AND, THROUGH EXTENSION "D", ENGAGES HALF-STEP YOKE (2) WITH ESCAPEMENT RACK (4). LEFT STUD (10B) ON KEYSTEM (10) ENTERING SLOT IN ARM (16) ROTATES SHAFT ASSEMBLY (17) AND THROUGH ARM (18) MOVES LIMIT LINK (1) TO THE REAR, PRESENTING STEP "B" IN THE PATH OF HALF-STEP YOKE (2). AS ESCAPEMENT FINGER (3) IS RETRACTED, ESCAPEMENT RACK (4), LIST UNIT AND YOKE (2) WILL MOVE TO THE LEFT 1-1/2 SPACES WITH YOKE (2) LIMITING ON STEP "B" OF LIMIT LINK (1). AS KEY (10) RESTORES, ARM (15) AND BAIL (8) WILL RESTORE. THIS PERMITS LINK (5) TO RESTORE TO ENGAGE ESCAPEMENT FINGER (3) WITH ESCAPEMENT RACK (4). ARM (12) AND LINK (13) WILL RESTORE UNDER SPRING TENSION, DISENGAGING YOKE (2) FROM ESCAPEMENT RACK (4). THIS PERMITS LIST UNIT TO COMPLETE THE DOUBLE ZERO ESCAPEMENT. ALSO, AS KEYSTEM (10) RESTORES, ARM (16), SHAFT (17), ARM (18) AND LINK (1) WILL RESTORE TO THE FRONT AGAIN POSITIONING STEP "C" IN THE PATH OF HALF-STEP YOKE (2). DEPRESSION OF TRIPLE ZERO KEY (9) THROUGH LEFT STUD (9A) ON KEYSTEM CONTACTING ARM (14), BAIL (8) WILL BE ROTATED TO POSITION THE SAME MECHANISM AS ON SINGLE AND DOUBLE ZERO KEYS. HOWEVER, SHAFT ASSEMBLY (17) WILL BE ROTATED SLIGHTLY FURTHER THAN ON DOUBLE ZERO KEY (10). THIS IS NECESSARY TO POSITION LINK (1) FURTHER TO THE REAR TO POSITION EXTENSION "A" INTO THE PATH OF HALF-STEP YOKE (2). THEREFORE, AS ESCAPEMENT FINGER (3) IS DISENGAGED, ESCAPEMENT RACK (4) AND HALF-STEP YOKE (2) WILL MOVE TO THE LEFT UNTIL YOKE (2) LIMITS ON EXTENSION "A", ESCAPING LIST UNIT 2-1/2 SPACES TO THE LEFT. AS TRIPLE ZERO KEY (9) RESTORES, LINK (1), LINK (13) AND LINK (5) WILL BE RESTORED TO PERMIT THE EXTRA HALF-SPACE ESCAPEMENT OF LIST UNIT. LIST UNIT WILL NOW BE ESCAPED 3 SPACES TO THE LEFT.

1.3

THE PURPOSE OF FIXED LIST UNIT GEAR (12) ON EXTREME RIGHT END OF LIST UNIT (10) IS TO PREVENT THE LIST UNIT FROM ESCAPING BEYOND 16TH COLUMN WHICH IS MACHINE CAPACITY. THAT IS, LISTING CAPACITY. THIS IS ACCOMPLISHED BY PREVENTING CONTROL SHAFT (4) FROM ROTATING, THUS ELIMINATING ESCAPING OF LIST UNIT.

1.4

IF MORE THAN 16 COLUMNS ARE INDEXED IN THE LIST UNIT, BY USE OF ZERO KEYS, THE LIST UNIT WILL ESCAPE TO A 16-1/2 SPACE POSITION BEING RESTRICTED BY ESCAPEMENT RACK ASSEMBLY (1) LIMITING ON LIMIT FINGER (28). THIS PLACES LIST UNIT GEARS LATERALLY OUT OF ENGAGEMENT WITH TRANSFER RACKS. THIS OPERATION IS NECESSARY IN THE EVENT THE OPERATOR INDEXES LIST UNIT 16 COLUMNS TO THE LEFT AND THEN DECIDES TO DEPRESS THE CORRECTION, TOTAL OR SUB-TOTAL KEYS. THIS IS SO THAT INDEXED FIGURES CAN BE CLEARED FROM THE LIST UNIT GEARS WITHOUT DRIVING TRANSFER RACKS. ALSO, WITH LIST UNIT IN 16-1/2 SPACE POSITION, ESCAPEMENT RACK ASSEMBLY (1) WILL CAM LOCK ARM (29) FORWARD TO BLOCK MULTIPLY AND DIVISION KEYS FROM DEPRESSION. THIS IS TO PREVENT MALFUNCTION OF MACHINE ON THESE OPERATIONS.

1.5

NO TWO DIGIT OR FEATURE KEYS (EXCEPT STOP, DECIMAL, STORAGE AND MULT SUB-TOTAL KEYS) CAN BE DEPRESSED AT ONE TIME DUE TO STEEL BALL INTERLOCK MECHANISM.

1.1.1 DIGIT KEY MOTOR TRIP

1.1.2
MACHINE NORMAL, PRE-TENSION COIL SPRING "A" (PLATE 1.2) IN LIST UNIT CONTROL SHAFT SPRING HOUSING ASSEMBLY (5) IMPARTS TENSION ON LIST UNIT CONTROL SHAFT (4) WHICH IS HELD IN NORMAL POSITION BY EXTENSION "A" (PLATE 1) LIMITING ON LIST UNIT CONTROL SHAFT LIMIT (3); ALSO, REWIND SLIP CLUTCH GEAR (3) (PLATE 1.2) HOLDS LIST UNIT CONTROL SHAFT SPRING HOUSING (5) TO PREVENT COIL SPRING "A" FROM UNWINDING.

1.1.3
AS LIST UNIT CONTROL SHAFT (4) ROTATES, TEETH ON LEFT END OF SHAFT (4) CAUSE LIST UNIT CONTROL REWIND LIMIT GEAR (2) TO ROTATE, WHICH MOVES STUD "B" TOWARD CENTER OF LIST UNIT CONTROL SHAFT SPRING HOUSING (5) AND, IN TURN, AWAY FROM LIST UNIT CONTROL SHAFT REWIND GEAR STUD LIMIT LINK (1). AS STUD "B" MOVES TOWARD CENTER OF HOUSING (5), DIGIT KEY MOTOR TRIP LINK ASSEMBLY (7) MOVES FORWARD, MOVING DIGIT KEY MOTOR TRIP LINK (10) TO OPERATE MICRO-SWITCH.

1.1.4
THROUGH TRAIN OF GEARS (11), (12) AND (13), REWIND SLIP CLUTCH GEAR (3) WILL ROTATE HOUSING ASSEMBLY (5) COUNTERCLOCKWISE. AS THIS ROTATES, IT CARRIES LIST UNIT CONTROL REWIND LIMIT GEAR (2) AROUND TEETH ON END OF LIST UNIT CONTROL SHAFT (4). THIS MOVEMENT CAUSES STUD "B" TO MOVE OUTWARD WHERE IT WILL LIMIT ON STEP "C" OF LIST UNIT CONTROL SHAFT REWIND GEAR STUD LIMIT LINK (1). AT SAME TIME, STUD "B" DRIVES DIGIT KEY MOTOR TRIP LINK ASSEMBLY (7) TO REAR, OPENING MICRO-SWITCH.

1.1.5
IT SHOULD BE NOTED AT THIS TIME THAT, ON DEPRESSION OF DIGIT KEYS ONE THRU SIX, MOTOR WILL BE TRIPPED WHEN KEYS ARE RELEASED TO RESTORE TO NORMAL AND, ON DIGIT KEYS SEVEN THRU NINE, MOTOR WILL BE TRIPPED ON DEPRESSION OF KEYS.

II. LIST UNIT

2.1
THE LIST UNIT (4) (PLATE 1.3) CONTAINS TWO SETS OF GEARS (1) WHICH SERVE TO TRANSFER THE NUMBERS INDEXED IN THE KEYBOARD TO THE TRANSFER RACKS (6) FOR ADDING AND SUBTRACTING INTO OTHER UNITS OF THE MACHINE.

2.2
LIST UNIT GEARS (1) ARE MOUNTED IN LIST UNIT GEAR FRAME (3) WHICH IS STEPPED TO THE LEFT AS EACH KEY IS DEPRESSED, ALIGNING EACH ORDER WITH THE LIST UNIT GEAR LOCATOR WHEEL (5) (PLATE 1). LIST UNIT GEAR FRAME (3) (PLATE 1.3) SLIDES ON LIST UNIT SLIDE BAR (12). Slide bar (12) also pivots for list between left center frame & right list unit support plate.

2.3
ON FIRST HALF OF MAINSHAFT CYCLE, LIST UNIT WILL BE LOWERED, MESHING LIST UNIT DRIVE GEAR (11) WITH LIST UNIT AND RECALL UNIT DRIVE RACK (10) AND LOWER LIST UNIT GEARS (1) WITH TRANSFER RACKS (6). WHEN LIST UNIT AND RECALL UNIT DRIVE RACK (10) IS DRIVEN REARWARD, LIST UNIT DRIVE SHAFT (7) WILL BE ROTATED, CAUSING DRIVING EDGE "A" TO PICK UP INTERNAL EARS "B" OF GEARS (1) ROTATING THEM TO NORMAL OR ZERO POSITION. AS GEARS (1) ARE ROTATED, TRANSFER RACKS (6) WILL BE DRIVEN REARWARD SAME NUMBER OF SPACES AS WERE INDEXED INTO GEARS (1).

2.4
AT START OF LAST HALF OF CYCLE, LIST UNIT WILL BE RESTORED TO "UP" POSITION, DISENGAGING LIST UNIT DRIVE GEAR (11) FROM DRIVE RACK (10), PERMITTING LIST UNIT DRIVE SHAFT (7) TO RESET TO NINE POSITION BY COIL SPRING "C" ON LEFT END OF LIST UNIT SLIDE

2.4 (CONT'D.)
BAR (12). LIST UNIT GEARS (1) WILL BE HELD IN ZERO POSITION BY LIST UNIT UPPER LOCK PLATE (9). IF LIST UNIT (4) IS ENGAGED ON RETURN STROKE, THE NUMBER WILL BE PUT BACK INTO LIST UNIT (4).

2.5
THE STATIONARY SHORT LIST UNIT GEAR SHAFT (8) FUNCTIONS AS A LIMIT STOP FOR GEARS (1) TO PREVENT OVERTHROW OF TRANSFER RACKS (6) AS THEY ARE DRIVEN REARWARD. THIS IS ACCOMPLISHED BY INTERNAL EAR "D" OF UPPER GEAR (1) LIMITING ON HIGH SURFACE "E" OF SHAFT (8).

III. LIST UNIT FORWARD & RETURN STROKE ACTUATOR HOOKS

3.1
THE LIST UNIT FORWARD AND RETURN STROKE ACTUATOR HOOKS (15) AND (2) (PLATE 2) CONTROL THE ENGAGING AND DISENGAGING OF LIST UNIT GEARS (9) WITH TRANSFER RACKS. NORMALLY, THE LIST UNIT FORWARD STROKE HOOK (15) IS ENGAGED WITH FORWARD STROKE ACTUATOR BAR (16) BY LIST UNIT FORWARD STROKE SLIDE (13) AND LIST UNIT RETURN STROKE ACTUATOR HOOK (2) IS DISENGAGED WITH RETURN STROKE ACTUATOR BAR (1).

3.2 ADD & SUBTRACT KEY OPERATION

ON AN ADD KEY OPERATION, AT START OF FIRST HALF OF MAINSHAFT CYCLE, FORWARD STROKE ACTUATOR BAR MAINSHAFT CAM (14) CONTACTS ROLL "B" ON FORWARD STROKE ACTUATOR BAR (16), DRIVING FORWARD PORTION OF BAR DOWNWARD. THIS, IN TURN, DRIVES LIST UNIT FORWARD STROKE ACTUATOR HOOK (15) DOWNWARD, ROTATING LIST UNIT ACTUATOR HOOK ASSEMBLY (3) WHICH PULLS LIST UNIT ACTUATOR LINK ADJUSTING PLATE (6) AND LIST UNIT ACTUATOR LINK (7) TO REAR. THIS ROTATES LIST UNIT ACTUATOR END PLATE (8), LOWERING LIST UNIT IN MESH WITH TRANSFER RACKS.

3.2.1
ON LAST HALF OF MAINSHAFT CYCLE, FORWARD STROKE ACTUATOR BAR MAINSHAFT CAM (14) WILL RELEASE FROM ROLL "B" ON FORWARD STROKE ACTUATOR BAR (16), PERMITTING BAR TO RESTORE THROUGH SPRING "A". AT SAME TIME, SPRING "C" WILL RESTORE LIST UNIT ACTUATOR HOOK ASSEMBLY (3) AND LIST UNIT WILL BE RESTORED THROUGH SPRING "D", DISENGAGING LIST UNIT GEARS (9) FROM TRANSFER RACKS.

3.3 TOTAL, SUB-TOTAL & CORRECTION OPERATION
ON TOTAL, SUB-TOTAL OR CORRECTION, THE OPERATION OF LIST UNIT IS THE SAME AS ADD AND SUBTRACT KEYS. IT IS NECESSARY, THEREFORE, TO DISENGAGE LIST UNIT GEARS (9) FROM TRANSFER RACKS. THIS IS ACCOMPLISHED BY HALF-STEPPING LIST UNIT TO LEFT ON DEPRESSION OF THESE KEYS WHICH LOCATES LIST UNIT GEARS (9) LATERALLY BETWEEN TRANSFER RACKS.

3.4 MULTIPLY AND DIVISION KEY OPERATION
DURING MULTIPLY OR DIVISION OPERATION, LIST UNIT IS RETAINED IN MESH WITH TRANSFER RACKS ON FIRST HALF AND LAST HALF OF MAINSHAFT CYCLE TO RETAIN DIVISOR OR MULTIPLICAND IN UNIT. THIS IS ACCOMPLISHED IN FOLLOWING MANNER:

3.4.1
LIST UNIT FORWARD STROKE HOOK (15) WILL BE ENGAGED WITH FORWARD STROKE ACTUATOR BAR (16) THROUGH LIST UNIT FORWARD STROKE SLIDE (13). THE LIST UNIT RETURN STROKE ACTUATOR HOOK (2) WILL BE ENGAGED WITH RETURN STROKE ACTUATOR BAR (1) BY U. CAM TO CONTROL DIVISION NON-PRINT (11) WHICH DRIVES LIST UNIT FORWARD STROKE ACTUATOR HOOK MULT CONTROL SLIDE (10) WHICH IN TURN DRIVES LIST UNIT RETURN STROKE HOOK CONTROL SLIDE (5) TO REAR AS U. CAM SHAFT ROTATES OUT OF NORMAL.

3.4.2
ON SPACE-OVER STROKE IN MULT OR BLANK STROKE BEFORE DIVISOR OR BACKSPACE ON DIVISION,

3.4.2 (CONT'D.)
LIST UNIT FORWARD STROKE SLIDE (13) IS RETRACTED TO DISENGAGE LIST UNIT FORWARD STROKE HOOK (15) FROM FORWARD STROKE ACTUATOR BAR (16) AND MULTIPLY LIST UNIT CONTROL SLIDE FINGER (4) IS PIVOTED TO DISENGAGE LIST UNIT RETURN STROKE ACTUATOR HOOK (2) FROM RETURN STROKE ACTUATOR BAR (1). THUS, LIST UNIT WILL NOT OPERATE ON THESE STROKES.

3.4.3
ON BLANK STROKE BEFORE PRODUCT IN MULT OR REMAINDER STROKE IN DIVISION, AS U. CAM TO CONTROL DIVISION NON-PRINT (11) ROTATES, RELEASING LIST UNIT FORWARD STROKE ACTUATOR HOOK MULTIPLY CONTROL SLIDE (10) AND LIST UNIT RETURN STROKE HOOK CONTROL SLIDE (5), LIST UNIT RETURN STROKE ACTUATOR HOOK (2) WILL BE DISENGAGED FROM RETURN STROKE ACTUATOR BAR (1). AT SAME TIME, CAM (11) WILL ROTATE YOKE (12) FOR LIST UNIT FORWARD STROKE SLIDE (13), RETRACTING SLIDE (13) TO DISENGAGE LIST UNIT FORWARD STROKE ACTUATOR HOOK (15) FROM FORWARD STROKE ACTUATOR BAR (16). THUS, LIST UNIT WILL BE INOPERATIVE ON THESE STROKES.

3.4.4
ON STOP KEY OPERATION IN MULT, ABOVE PROCEDURE WILL TAKE PLACE. ON DIVISION, FORWARD AND RETURN STROKE, HOOKS (15) AND (2) WILL BE CONTROLLED IN SAME MANNER AS ON BACKSPACE STROKE.

IV. LIST UNIT RESET MECHANISM

4.1
THE LIST UNIT RESET MECHANISM CONSISTS OF MULTIPLY COUNTER CONNECTOR PLATE (9) (PLATE 3) MOUNTED ON ESCAPEMENT RACK ASSEMBLY (8) WITH FINGER "C" ENGAGED IN LIST UNIT, ESCAPEMENT RACK RESET GEAR (12), LIST UNIT RESET SEGMENT, UPPER (6), LIST UNIT RESET SEGMENT, LOWER (5) AND LIST UNIT RESET BELLCRANK ASSEMBLY (4).

4.2
AS ITEMS ARE ENTERED IN LIST UNIT, LIST UNIT DRAW SPRING "B" WILL ROTATE LIST UNIT RESET SEGMENT (6) AND ESCAPEMENT RACK RESET GEAR (12) WHICH, IN TURN, MOVES ESCAPEMENT RACK ASSEMBLY (8) TO LEFT. AS ESCAPEMENT RACK ASSEMBLY (8) MOVES TO LEFT, LIST UNIT WILL MOVE TO LEFT THROUGH MULTIPLY COUNTER CONNECTOR PLATE (9).

4.3
ON LAST HALF OF MAINSHAFT CYCLE, LIST UNIT WILL BE SPRING-RESTORED TO "UP" POSITION, OUT OF MESH WITH TRANSFER RACKS. LIST UNIT RESET CAM (13) ON MAINSHAFT WILL CONTACT ROLL "D" ROTATING LIST UNIT RESET BELLCRANK ASSEMBLY (4) AND, THROUGH ECCENTRIC STUD "A", ROTATES LIST UNIT RESET SEGMENT, LOWER (5). THIS, IN TURN, ROTATES LIST UNIT RESET SEGMENT (6) AND ESCAPEMENT RACK RESET GEAR (12), MOVING ESCAPEMENT RACK (8) AND MULTIPLY COUNTER CONNECTOR PLATE (9) TO RIGHT, RESTORING LIST UNIT TO RIGHT.

4.4
RUBBER BUMPER (11) ON RIGHT END OF LIST UNIT SLIDE BAR (10) SERVES AS A CUSHION FOR LIST UNIT AS IT RESTORES TO THE RIGHT.

V. FEATURE KEY MOTOR TRIP

5.1
DEPRESSION OF ANY OF THE FOLLOWING KEYS WILL INITIATE A MACHINE OPERATION: DIVISION, MULTIPLY, CORRECTION, ADD, SUBTRACT, SUB-TOTAL AND TOTAL. SINCE ALL OPERATIONS ARE SIMILAR, WE WILL USE THE ADD KEY AS AN EXAMPLE.

5.2
PARTIAL DEPRESSION OF ADD KEY CAMS ADD KEY LOCK AND TRIP SLIDE (4) (PLATE 4) FORWARD TO CONTACT ARM (3) AND ROTATE MOTOR TRIP SHAFT (20). MOTOR TRIP HOOK (10) MOVES FORWARD, PULLING FULL STROKE ARM LIFT LINK (12) FORWARD, RELEASING FULL STROKE ARM (6). AT SAME TIME, EXTENSION "B" MOVES FORWARD, ALLOWING FINGER "A" ON FEATURE KEY LOCK BAR ASSEMBLY (5) TO DROP TO LOWER STEP, LATCHING ADD KEY LOCK AND TRIP SLIDE (4) FORWARD AND, IN TURN, TRAPPING ADD KEY.

5.3
AS ADD KEY IS FURTHER DEPRESSED, EXTENSION "B" CONTINUES TO MOVE FORWARD, ALLOWING FINGER "A" ON FEATURE KEY LOCK BAR ASSEMBLY (5) TO FALL OFF EXTENSION "B" AND LATCH ADD KEY LOCK AND TRIP SLIDE (4) FORWARD.

5.4
FULL STROKE ARM (6) WILL, IN TURN, BE LOWERED AND, THROUGH FULL STROKE LIFT LINK ECCENTRIC SCREW "C", PIVOT FULL STROKE LINK ASSEMBLY (17) WITH REAR OF FULL STROKE LINK ASSEMBLY (17) RAISING REAR OF DIGIT KEY MOTOR TRIP LINK (15) TO BEVELED SURFACE OF MICRO-SWITCH ARM "D" (PLATE 1.2) WHICH COMPLETES A CIRCUIT TO MOTOR.

5.5
AS REAR OF FULL STROKE LINK ASSEMBLY (17) (PLATE 4) RAISED, POINT "D" RELEASED DRIVE CLUTCH PAWL (16) WHICH ENGAGED TEETH ON DRIVE CLUTCH GEAR ASSEMBLY (6) (PLATE 1.2).

5.6
AS MOTOR OPERATES, DRIVE CLUTCH GEAR ASSEMBLY (6), WHICH IS KEYED TO MAINSHAFT, WILL ROTATE DRIVE CLUTCH PLATE ASSEMBLY (14) (PLATE 4) AND, AT APPROXIMATELY 250° ROTATION OF DRIVE CLUTCH PLATE ASSEMBLY (14), FULL STROKE RESTORING BELLCRANK ASSEMBLY (13) WILL MOVE TO LOW SURFACE OF DRIVE CLUTCH PLATE ASSEMBLY (14) WHICH LOWERS FULL STROKE ARM LIFT LINK (12), RELEASING IT FROM MOTOR TRIP HOOK (10) AND ALLOWING IT TO MOVE REARWARD TO UNDERLIE FULL STROKE ARM (6).

5.7
CONTINUED ROTATION OF DRIVE CLUTCH PLATE ASSEMBLY (14) CAUSES FULL STROKE RESTORING BELLCRANK ASSEMBLY (13) TO ROTATE, WITH FULL STROKE ARM LIFT LINK (12) RESTORING FEATURE KEY LOCK BAR ASSEMBLY (5) THRU FULL STROKE ARM (6) WHICH RELEASES ADD KEY LOCK AND TRIP SLIDE (4). AS FULL STROKE ARM (6) IS RESTORED, FULL STROKE LINK ASSEMBLY (17) WILL LOWER DIGIT KEY MOTOR TRIP LINK (15) TO INTERRUPT MOTOR CIRCUIT AND POINT "D" WILL BE IN POSITION TO INTERCEPT AND DISENGAGE DRIVE CLUTCH PAWL (16).

5.8
AT THE END OF CYCLE, MOTOR BACKSTOP ASSEMBLY (9) (PLATE 1.2) WILL MOVE UNDER HIGH SURFACE OF DRIVE CLUTCH PLATE ASSEMBLY (8) TO PREVENT ANY BACKWARD MOVEMENT TO MAINSHAFT.

5.9
ON FIRST MOTOR TRIP OPERATION OF EITHER A MULTIPLICATION OR DIVISION PROBLEM, THE MACHINE WILL OPERATE FOR ONE CYCLE ONLY AND THE ACTION FOR THE MOTOR TRIP IS SIMILAR

5.9 (CONT'D.)
TO ADD KEY OPERATION. ON SECOND AND FOLLOWING MACHINE CYCLES FOR A MULTIPLICATION OR DIVISION PROBLEM, MOTOR WILL CONTINUE TO OPERATE THROUGH M & Q BRIDGE CONTROL SLIDE (9) (PLATE 4) AND CONTINUOUS RUNNING SLIDE ASSEMBLY (8).

5.10
DURING EITHER OF THESE PROBLEMS, U. CAM TO CONTROL M & Q MECHANISM (7) IS POSITIONED LEFT OR RIGHT AND ROTATED SO HIGH CONTOUR OF CAM WILL MOVE M & Q BRIDGE CONTROL SLIDE (9) REARWARD; WHICH, IN TURN, CARRIES CONTINUOUS RUNNING SLIDE (8) REARWARD, ROTATING CONTINUOUS RUNNING BELLCRANK (11). NOW, AS FULL STROKE ARM LIFT LINK (12) IS OPERATED VERTICALLY, STUD ON CONTINUOUS RUNNING BELLCRANK (11) WILL HOLD FULL STROKE ARM LIFT LINK (12) FORWARD SO IT CANNOT CONTACT AND RAISE FULL STROKE ARM (6). MACHINE WILL CONTINUE TO OPERATE UNTIL U. CAM TO CONTROL M & Q MECHANISM (7) IS RESTORED TO NORMAL POSITION, WHICH WILL RELEASE M & Q BRIDGE CONTROL SLIDE (9) AND PERMIT FULL STROKE ARM LIFT LINK (12) TO FUNCTION AND RELEASE MULTIPLY MOTOR TRIP SLIDE ASSEMBLY (19).

VI. MOTOR AND GOVERNOR - PLATE 4.1

6.1
THE MODEL 104 HAS A UNITIZED MOTOR AND GOVERNOR ASSEMBLY. THE SPEED CONTROL ACTION IS GOVERNED BY THE OPENING AND CLOSING OF A SET OF GOVERNOR CONTACTS (1) BEING OPERATED BY GOVERNOR ACTUATING ARMS (2) AND (3) AFFECTED BY CENTRIFUGAL FORCE.

6.2
THE SPRING TENSION ON THE GOVERNOR CONTACT OPERATING ARM (4) AND GOVERNOR CONTACTS (1) DETERMINES THE FORCE NECESSARY TO OPEN THE CONTACTS (1).

6.3
MACHINE IN NORMAL STATE, WITH LINE CORD PLUGGED IN, CIRCUIT TO MOTOR WILL BE BROKEN DUE TO DIGIT KEY MOTOR TRIP MICRO-SWITCH (5) BEING OPEN. WHEN A FEATURE KEY IS DEPRESSED, DIGIT KEY MOTOR TRIP MICRO-SWITCH (5) WILL CLOSE. THIS WILL ALLOW CURRENT TO FLOW THROUGH FUSE (F1), MICRO-SWITCH (5) AND GOVERNOR CONTACTS (1), COMPLETING CIRCUIT TO MOTOR. AS MOTOR OPERATES, GOVERNOR CONTACTS (1) WILL BE OPENED AND CURRENT WILL THEN FLOW THROUGH (R1) RESISTOR WHICH DECREASES CURRENT FLOW, REDUCING MOTOR SPEED. AS MOTOR SPEED REDUCES, GOVERNOR CONTACTS (1) WILL BE CLOSED, AGAIN ALLOWING MAXIMUM CURRENT TO FLOW THROUGH GOVERNOR CONTACTS (1), INCREASING MOTOR SPEED.

6.4
WHEN FEATURE KEY IS DEPRESSED, CONTACT POINTS WITHIN MICRO-SWITCH (5) WILL BE CLOSED COMPLETING CIRCUIT TO MOTOR. AS MOTOR OPERATES, GOVERNOR BALL "A" WILL BE URGED OUTWARD BY GOVERNOR ACTUATING ARMS (2) AND (3). AS GOVERNOR BALL "A" IS MOVED OUTWARD, IT CONTACTS STUD "B" AND ROTATES GOVERNOR ACTUATING BAIL (4) TO OPEN GOVERNOR CONTACTS WHICH PLACES (R1) RESISTOR IN SERIES WITH THE MOTOR, REDUCING CURRENT FLOW, CAUSING MOTOR TO SLOW DOWN. THIS ALLOWS GOVERNOR CONTACTS (1) TO CLOSE, AGAIN APPLYING MAXIMUM CURRENT TO MOTOR. CLOSING OF GOVERNOR CONTACTS (1) IS ACCOMPLISHED THROUGH SPRING "C". THE OPENING AND CLOSING OF GOVERNOR CONTACTS (1) IS WITH SUCH RAPIDITY THAT THE SPEED OF MOTOR WILL REMAIN CONSTANT. THE PURPOSE OF (R1) RESISTOR IS TO SUPPRESS ARCING OF GOVERNOR CONTACTS (1) TO PROVIDE A SMOOTHER OPERATION OF MOTOR.

6.5
LOW SPEED IS CHECKED BY INDEXING A TWO IN THE KEYBOARD AND DEPRESSING THE ADD KEY TO ENTER THE TWO IN RECALL UNIT. (PLATE 4) WHILE HOLDING THE CONTINUOUS RUNNING SLIDE (8) TO THE REAR, DEPRESS THE ADD KEY THE SECOND TIME AND ADD FOR THIRTY SECONDS. TOTAL SHOULD BE 195, PLUS OR MINUS 5.

HIGH SPEED IS CHECKED BY DIVIDING 300 BY 001 FOR SIXTY SECONDS. STOP MACHINE WITH STOP KEY. DEDUCT REMAINDER FROM 300 TO DERIVE HIGH SPEED. HIGH SPEED SHOULD BE 265, PLUS OR MINUS 3.

VII. CORRECTION

7.1
DEPRESSION OF CORRECTION KEY (21) (PLATE 5) CAUSES STUD "F" ON KEY TO CONTACT CORRECTION KEY SHAFT ACTUATING FINGER (20) AND, IN TURN, ROTATE CORRECTION KEY SHAFT (13) TO WHICH CORRECTION NON-PRINT CONTROL FINGER (30) IS ATTACHED. THIS ACTUATES NON-PRINT CONTROL SLIDE (8), PLACING FORWARD STROKE NON-PRINT ACTUATOR HOOK (7) IN POSITION TO BE OPERATED BY FORWARD STROKE ACTUATOR BAR (5).

7.2
DEPRESSION OF CORRECTION KEY ALSO CAMS CORRECTION KEY SLIDE (23) TO REAR AND CORRECTION KEY MOTOR TRIP SLIDE (22) FORWARD. AS CORRECTION KEY SLIDE (23) MOVES REARWARD, CORRECTION SLIDE HALF-STEP ACT FINGER BRACKET (24) ROTATES CORRECTION KEY HALF-STEP ACTUATOR BAIL (28), IMPARTING REARWARD MOVEMENT TO ZERO ESCAPEMENT SLIDE (16). EXTENSION "E" ON ZERO ESCAPEMENT SLIDE (16) WILL CONTACT AND HOLD HALF-STEP YOKE (14) TO REAR SO TOOTH ON HALF-STEP YOKE WILL INTERCEPT ESCAPEMENT RACK ASSEMBLY. AT SAME TIME, ZERO ESCAPEMENT ACTUATOR LINK (17) WILL BE MOVED REARWARD TO CONTACT AND PIVOT ESCAPEMENT FINGER (15) OUT OF ESCAPEMENT RACK TO ALLOW LIST UNIT TO MOVE ONE-HALF SPACE TO LEFT SO LIST UNIT GEARS WILL NOT ALIGN WITH TRANSFER RACKS.

7.3
AS CORRECTION KEY MOTOR TRIP SLIDE (22) MOVES FORWARD, EXTENSION (G) CONTACTS EXTENSION (H) ON NON-ADD LINK (29) MOVING LINK (29) FORWARD. FORWARD MOVEMENT OF LINK (29) ROTATES NON-ADD SHAFT (10) RELEASING NON-ADD FLANGE FROM FINGER (D) ON ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (12). THIS WILL PERMIT ACCUMULATOR FORWARD STROKE ACTUATOR HOOK TO WITHDRAW FROM PATH OF FORWARD STROKE ACTUATOR BAR(5) WHICH PREVENTS ACCUMULATOR UNIT FROM ENGAGING TRANSFER RACKS. THUS, ITEM ENTERED IN LIST UNIT WILL BE NON-ADDED. THIS OPERATION IS NECESSARY WHEN DIVISOR HAS SAME NUMBER OF DIGITS AS DIVIDEND, SINCE LIST UNIT CANNOT HALF-STEP TO LEFT TO POSITION LIST UNIT GEARS BETWEEN TRANSFER RACKS.

7.4
FORWARD MOVEMENT OF CORRECTION KEY MOTOR TRIP SLIDE (21) (PLATE 4) INTERCEPTS STEEL BALLS IN BALL HOUSING SUPPORT BRACKET TO BLOCK ALL OTHER DIGIT KEYS AND FEATURE KEYS. CORRECTION KEY MOTOR TRIP SLIDE (21) ALSO CONTACTS ARM (22) ON MOTOR TRIP SHAFT ASSEMBLY (20) CAUSING MOTOR TRIP OPERATION AND IS LATCHED FORWARD BY FEATURE KEY LOCK BAR (5), IN TURN HOLDING CORRECTION KEY SLIDE (23) (PLATE 5) REARWARD AND CORRECTION KEY (21) DEPRESSED.

7.5
AS MAINSHAFT STARTS TO ROTATE, FORWARD STROKE ACTUATING BAR (5) MOVES DOWN, CONTACTING AND ROTATING FORWARD STROKE NON-PRINT ACTUATOR HOOK (7). ARM "C" CONTACTS NON-PRINT BELLCRANK (1) WHICH, THROUGH ARM "A", CONTACTS LIP "B" ON TYPE FIRING PLATE (32), MOVING IT TO RIGHT INTO POSITION TO BLOCK PRINTING ACTION AND PAPER FEED.

7.6
AS FORWARD STROKE ACTUATING BAR (5) MOVES DOWN, LIST UNIT WILL BE ACTUATED SO LIST UNIT DRIVE GEAR (11) (PLATE 1.3) WILL ENGAGE WITH LIST UNIT AND RECALL DRIVE RACK (10). AS LIST UNIT IS ACTUATED, CORRECTION KEY RELEASE PLATE (26) (PLATE 5) MOVES DOWN AND, THROUGH SPRING TENSION, CORRECTION SLIDE HALF-STEP ACTUATING FINGER (25) MOVES REARWARD OVERLYING CORRECTION KEY RELEASE PLATE (26).

7.7
AS MAINSHAFT CONTINUES TO ROTATE, LIST UNIT AND RECALL UNIT DRIVE RACK (10) (PLATE 1.3) WILL ROTATE LIST UNIT DRIVE GEAR (11) WHICH ROTATES ALL LIST UNIT GEARS TO ZERO POSITION; HOWEVER, TRANSFER RACKS WILL NOT MOVE BECAUSE LIST UNIT IS HALF-STEPPED, PLACING LIST UNIT GEARS BETWEEN TRANSFER RACKS.

7.8
DURING LAST HALF OF MAINSHAFT CYCLE, THE FORWARD STROKE ACTUATING BAR (5) (PLATE 5) RESTORES TO NORMAL, ALLOWING FORWARD STROKE NON-PRINT ACTUATOR HOOK (7) AND TYPE FIRING PLATE (32) TO RESTORE. ALSO, LIST UNIT WILL RAISE AND, AT THIS TIME, CORRECTION KEY RELEASE PLATE (26) ROTATES CORRECTION SLIDE HALF-STEP ACTUATING FINGER (25) COUNTERCLOCKWISE, WHICH, IN TURN, CAUSES CORRECTION SLIDE HALF-STEP ACTUATOR FINGER BRACKET (24) TO RELEASE CORRECTION KEY HALF-STEP ACTUATING BAIL (28). THIS ACTION ALLOWS ZERO ESCAPEMENT SLIDE (16) TO MOVE FORWARD AND HALF-STEP YOKE (14) TO WITHDRAW FROM ESCAPEMENT RACK AND, THRU ZERO ESCAPEMENT ACTUATOR LINK (17) ALLOW ESCAPEMENT FINGER (15) TO ENGAGE WITH ESCAPEMENT RACK.

7.9
AS MAINSHAFT CONTINUES TO ROTATE TO HOME POSITION, LIST UNIT WILL BE RESTORED TO RIGHT AND FEATURE KEY LOCK BAR WILL RESTORE, RELEASING CORRECTION KEY MOTOR TRIP SLIDE (22), CORRECTION KEY SLIDE (23) AND CORRECTION KEY (21).

WHEN CORRECTION KEY (21) RESTORES, STUD "F" ON CORRECTION KEY RELEASES CORRECTION KEY SHAFT ACTUATING FINGER (20) AND, THROUGH CORRECTION NON-PRINT CONTROL FINGER (30) ALLOWS NON-PRINT CONTROL SLIDE (8) TO MOVE FORWARD UNDER INFLUENCE OF SPRING, WITHDRAWING FORWARD STROKE NON-PRINT ACTUATOR HOOK (7).

7.10
THE RECALL UNIT ACTION IS THE SAME AS IN NORMAL ADD OPERATION; I.E., OUT OF MESH ON FORWARD STROKE TO ALLOW RECALL UNIT GEARS TO RETURN TO ZERO POSITION AND IN MESH ON RETURN STROKE. HOWEVER, SINCE TRANSFER RACKS DID NOT MOVE (EXCEPT FOR CONDITIONS IN PARA. 7.11) RECALL UNIT GEARS WILL REMAIN AT ZERO (SEE RECALL UNIT, SECTION IX)

7.11 CORRECTION KEY (DIVISION)

IF CORRECTION KEY (21) IS USED AFTER ERRONEOUS ENTRY OF DIVIDEND UNDER CONDITION WHERE LIST UNIT CANNOT HALF-STEP, NUMBER(S) BEING CORRECTED WILL BE ENTERED INTO RECALL UNIT. IF STORAGE KEY IS USED AFTER CORRECTED ENTRY, CORRECTED ENTRY WILL BE STORED IN RECALL UNIT.

Very Important

VIII. TRANSFER RACKS AND DRIVE RACKS

8.1

THERE ARE SEVENTEEN TRANSFER RACKS (21) & (41) (PLATE 6) TO TRANSMIT INFORMATION FROM ONE UNIT TO ANOTHER. THEY ARE CONSTRUCTED WITH THREE GROUPS OF TEETH TO CONNECT WITH VARIOUS UNITS IN MACHINE, I.E., UPPER FRONT TEETH TO CONNECT WITH LIST UNIT, LOWER FRONT TEETH TO MESH WITH RECALL UNIT AND ACCUMULATOR UNIT AND UPPER REAR TEETH TO MESH WITH MULT UNIT AND PRINTING UNIT. THE UPPER REAR TEETH ARE ALSO USED IN CONJUNCTION WITH RACK ALIGNING BLADE (2) TO HOLD TRANSFER RACKS AT THE TIME OF PRINTING. THE LOWER REAR TEETH ARE USED IN CONJUNCTION WITH RACK REBOUND LOCK PLATE (25) TO PREVENT TRANSFER RACKS FROM REBOUNDING FORWARD.

REFER TO TRANSFER RACK CHART BELOW FOR THE TRANSMITTING OF ITEMS FROM ONE UNIT TO ANOTHER:

OPERATION	FROM	TO
ADD	LIST UNIT	ACCUMULATOR (+), PRINTING TYPE, *RECALL UNIT
SUBTRACT	LIST UNIT	ACCUMULATOR (-), PRINTING TYPE, *RECALL UNIT
RECALL	RECALL UNIT	ACCUMULATOR (+) OR (-), PRINTING TYPE, MULT UNIT FIRST FACTOR, *RECALL UNIT
TOTAL	ACCUMULATOR (-)	PRINTING TYPE, *RECALL UNIT
SUB-TOTAL	ACCUMULATOR (-)	PRINTING TYPE, *RECALL UNIT, ACCUMULATOR UNIT
MULTIPLICATION		
FIRST FACTOR	LIST UNIT	MULT UNIT, PRINTING TYPE, *RECALL UNIT
SECOND FACTOR	LIST UNIT	PRINTING TYPE, LIST UNIT
COUNTING CYCLES	LIST UNIT	ACCUMULATOR (+), PRINTING TYPE, LIST UNIT
**READ-OUT OF MULT	MULT UNIT	PRINTING TYPE, *RECALL UNIT
MULT TOTAL	ACCUMULATOR (-)	PRINTING TYPE, *RECALL UNIT
MULT SUB-TOTAL	ACCUMULATOR (-)	PRINTING TYPE, *RECALL UNIT, ACCUMULATOR
DIVISION		
DIVIDEND	LIST UNIT	ACCUMULATOR (+), PRINTING TYPE, *RECALL UNIT
***CORR. OF DIVISOR	LIST UNIT	PRINTING TYPE, *RECALL UNIT
DIVISOR	LIST UNIT	ACCUMULATOR (-), PRINTING TYPE, LIST UNIT
COUNT & ADD BACK	LIST UNIT	ACCUMULATOR(-) AND(+), PRINTING TYPE, LIST UNIT
REMAINDER	ACCUMULATOR (-)	PRINTING TYPE, *RECALL UNIT
DIV. TOTAL	MULT UNIT	PRINTING TYPE, *RECALL UNIT

*UNLESS STORAGE KEY IS LATCHED DOWN
**STOP KEY OPERATION
***REFER TO PARA. 7.11

8.2
THERE ARE THREE DRIVE RACKS LOCATED TO LEFT OF TRANSFER RACKS AND ONE TO RIGHT OF RACKS. THESE OPERATE THE VARIOUS UNITS IN MACHINE. DRIVE RACKS FROM LEFT TO RIGHT ARE MULT DRIVE RACK (35), LIST UNIT, RECALL UNIT AND TRANSFER CAM SHAFT DRIVE RACK (36), TOTAL DRIVE RACK (39) AND RECALL UNIT LOCK PLATE RELEASE DRIVE RACK (3).

8.2.1
MULT DRIVE RACK (35) WILL OPERATE ONLY ON BLANK STROKE IN MULT TO DRIVE OUT REMAINING ITEMS IN MULT UNIT GEARS ON STOP KEY OPERATION OR ON QUOTIENT STROKE IN DIVISION TO DRIVE OUT QUOTIENT IN MULT UNIT GEARS. AS U. CAM SHAFT (10) ROTATES OUT OF NORMAL, U. CAM TO CONTROL QUOTIENT PRINTING (33) ACTUATES MULT DRIVE RACK CONTROL BELLCRANK (32), RELEASING MULT DRIVE RACK ACTUATOR FINGER (34), PERMITTING IT TO INTERCEPT LUG "G" ON MULT DRIVE RACK (35) THROUGH TENSION SPRING (37).

8.2.2
ON FIRST HALF OF MAINSHAFT CYCLE, MULT UNIT DRIVE GEAR WILL MESH WITH DRIVE RACK (35) AND MULT UNIT GEARS WILL MESH WITH TRANSFER RACKS (21) AND (41). RACK DRIVING MAINSHAFT CAM (29) WILL CONTACT ROLL "E" AND ROTATE RACK RESET BELLCRANK (27) AND, THROUGH RACK RESET LINK (26), RACK RESET SHAFT (31) IS DRIVEN REARWARD. THIS, IN TURN, WILL DRIVE MULT DRIVE RACK ACTUATOR FINGER (34) AND MULT DRIVE RACK (35) REARWARD WHICH WILL ROTATE MULT UNIT GEARS TO NORMAL AND, IN DOING SO, WILL DRIVE TRANSFER RACKS (21) AND (41) REARWARD.

8.2.3
ON LAST HALF OF MAINSHAFT CYCLE, RACK RESET MAINSHAFT CAM (28) WILL CONTACT ROLL "D" AND ROTATE RACK RESET BELLCRANK (27), DRIVING RACK RESET SHAFT (31), MULT DRIVE RACK ACTUATOR FINGER (34), MULT DRIVE RACK (35) AND TRANSFER RACKS (21) AND (41) FORWARD TO NORMAL. AT THIS TIME, MULT UNIT WILL BE OUT OF MESH WITH TRANSFER RACKS; THEREFORE, MULT UNIT GEARS WILL REMAIN IN NORMAL OR ZERO POSITION.

8.2.4
ON NEXT ROTATION OF U. CAM SHAFT (10), U. CAM TO CONTROL QUOTIENT PRINTING (33) RELEASES MULT DRIVE RACK CONTROL BELLCRANK (32) WHICH, IN TURN, PIVOTS MULT DRIVE RACK ACTUATOR FINGER (34), RELEASING IT FROM LUG "G" ON MULT DRIVE RACK (35).

8.3
THE LIST UNIT, RECALL UNIT AND TRANSFER CAM SHAFT DRIVE RACK (36) IS PERMANENTLY AFFIXED TO RACK RESET SHAFT (31) AND WILL BE DRIVEN FORWARD AND REARWARD ON EACH MAINSHAFT CYCLE.

8.3.1
THIS RACK IS CONSTRUCTED WITH THREE GROUPS OF TEETH WHICH OPERATE THE FOLLOWING UNITS - - LOWER FRONT TEETH OPERATE RECALL UNIT; UPPER TEETH OPERATE LIST UNIT AND LOWER REAR TEETH OPERATE TRANSFER CAM SHAFT IN ACCUMULATOR UNIT.

IT SHOULD ALSO BE NOTED THAT REAR TEETH ON RACK WILL BE CONSTANTLY ENGAGED WITH ACCUMULATOR CAM SHAFT DRIVE GEAR (58) (PLATE 8.2) WHICH IS MESHED WITH ACCU. CAM DRIVE GEAR (25). THEREFORE, CAM SHAFT (1) IN ACCUMULATOR SECTION WILL BE ROTATED 360° ON EACH MAINSHAFT CYCLE.

8.3.2
AT START OF FIRST HALF OF MAINSHAFT CYCLE, LIST UNIT DRIVE GEAR WILL MESH WITH DRIVE RACK (36) (PLATE 6) AND LIST UNIT GEARS WILL MESH WITH TRANSFER RACKS (21) AND (41) AND/OR RECALL UNIT DRIVE GEAR WILL MESH WITH DRIVE RACK (36) AND RECALL UNIT GEARS WILL MESH WITH TRANSFER RACKS. MACHINE OPERATION DETERMINES WHICH UNIT WILL MESH

8.3.2 (CONT'D)
WITH DRIVE RACK (36) AND TRANSFER RACKS. THRU CONTINUED ROTATION OF MAINSHAFT DRIVE RACK (36) WILL ROTATE LIST UNIT GEAR SHAFT OR RECALL UNIT GEAR SHAFT WHICH, IN TURN, ROTATES LIST UNIT GEARS OR RECALL UNIT GEARS, DRIVING TRANSFER RACKS REARWARD.

8.3.3
ON LAST HALF OF MAINSHAFT CYCLE, RACK RESET SHAFT (31) WILL DRIVE TRANSFER RACKS (21) AND (41) AND DRIVE RACK (36) FORWARD. IF EITHER UNIT IS IN MESH AT THIS TIME, DRIVE RACK (36) WILL ROTATE LIST UNIT GEAR SHAFT OR RECALL UNIT GEAR SHAFT TO NORMAL AND TRANSFER RACKS WILL ROTATE LIST UNIT GEARS OR RECALL UNIT GEARS TO PREVIOUS POSITION.

8.4
THE TOTAL DRIVE RACK (39) ONLY OPERATES ON TOTAL OR SUB-TOTAL KEY DEPRESSION, TOTAL STROKE IN MULTIPLICATION AND REMAINDER STROKE IN DIVISION.

8.4.1
WHEN TOTAL OR SUB-TOTAL KEY IS DEPRESSED, TOTAL AND SUB-TOTAL SLIDE (18) MOVES REARWARD, PIVOTING TOTAL DRIVE RACK CONTROL LINK (20) WHICH, IN TURN, ROTATES TOTAL DRIVE RACK CONTROL YOKE (17), RELEASING TOTAL DRIVE RACK ACTUATOR FINGER (30), PERMITTING IT TO INTERCEPT LUG "F" ON TOTAL DRIVE RACK (39) THROUGH TENSION SPRING (37).

8.4.2
AS U. CAM SHAFT (10) IS ROTATED TO MULTIPLY TOTAL POSITION OR REMAINDER POSITION ON DIVISION, U. CAM TO CONTROL SUBTRACT ACTUATOR HOOK (19) DRIVES TOTAL AND SUB-TOTAL SLIDE (18) REARWARD, POSITIONING PARTS AS PREVIOUSLY EXPLAINED UNDER TOTAL AND SUB-TOTAL KEY OPERATION.

8.4.3
ON FIRST HALF OF MAINSHAFT CYCLE, RACK DRIVING MAINSHAFT CAM (29) CONTACTS ROLL "E" AND ROTATES RACK RESET BELLCRANK (27) AND, THROUGH RACK RESET LINK (26), RACK RESET SHAFT (31) IS DRIVEN REARWARD. THIS, IN TURN, WILL DRIVE ACTUATOR FINGER (30) AND TOTAL DRIVE RACK (39) REARWARD WHICH WILL ROTATE SUBTRACT GEAR SHAFT AND SUBTRACT GEARS IN ACCUMULATOR SECTION TO NORMAL AND, IN DOING SO, WILL DRIVE TRANSFER RACKS (21) AND (41) REARWARD.

8.4.4
ON LAST HALF OF MAINSHAFT CYCLE, RACK RESET MAINSHAFT CAM (28) WILL CONTACT ROLL "D" AND ROTATE RACK RESET BELLCRANK (27), DRIVING RACK RESET SHAFT (31), TOTAL DRIVE RACK (39), TOTAL DRIVE RACK ACTUATOR FINGER (30) AND TRANSFER RACKS FORWARD.

8.4.5
WHEN TOTAL OR SUB-TOTAL AND/OR WHEN U. CAM SHAFT (10) RESTORES TO NORMAL, TOTAL AND SUB-TOTAL CONTROL SLIDE (18) WILL RESTORE, PERMITTING TOTAL DRIVE RACK CONTROL YOKE (17) TO RESTORE. THIS, IN TURN, WILL PIVOT TOTAL DRIVE RACK ACTUATOR FINGER (30), DISENGAGING IT FROM LUG "F" ON TOTAL DRIVE RACK (39).

8.5
THE RECALL LOCK PLATE RELEASE RACK (3) IS PERMANENTLY AFFIXED TO RACK RESET SHAFT (31) AND WILL BE DRIVEN REARWARD AND FORWARD ON EACH MAINSHAFT CYCLE.

8.5.1
PLATE ATTACHED AT FRONT END OF RACK (3) WILL ACTUATE RECALL UNIT LOCK PLATE LIFT CAM LATCH (6) (PLATE 7), LOWERING RECALL UNIT LOCK PLATE (10) TO PERMIT RECALL UNIT GEARS TO RESTORE TO NORMAL. THIS ACTION OCCURS WHEN RACK (3) (PLATE 6) IS DRIVEN

8.5.1 (CONT'D)
REARWARD BY RACK RESET SHAFT (31) ON FIRST HALF OF CYCLE.

NOTE: THIS OPERATION WILL NOT TAKE PLACE WHEN STORAGE KEY IS DEPRESSED.

8.5.2
EXTENSION "A" IN CENTER OF RACK (3) SERVES AS A LOCK FOR TRANSFER CAM SHAFT AFTER SHAFT AND RACK (3) HAVE RESTORED TO HOME POSITION. THIS IS NECESSARY TO PREVENT OVERTHROWING OF CAM SHAFT.

8.6
THE CHARACTER RACK (4) IS THE FIRST RACK ON RIGHT AND IS MOVED REARWARD THROUGH TENSION OF SPRING "B" AS RACK RESET SHAFT (31) IS MOVED REARWARD ON FIRST HALF OF MAINSHAFT CYCLE. REARWARD TRAVEL OF CHARACTER RACK (4) WILL BE RESTRICTED BY EITHER CHARACTER SLIDES (8) (T); (7) (ST); (5) (S); AND (6) (A) MOUNTED ON LOWER KEYBOARD PLATE OR CHARACTER FAN (12). CHARACTER RACK (4) WILL BE RESTORED ON LAST HALF OF MAINSHAFT CYCLE BY RACK RESET SHAFT (31).

8.6.1
WHEN ADD, SUBTRACT, TOTAL OR SUB-TOTAL KEYS ARE DEPRESSED, THEIR RESPECTIVE SLIDES WILL BE PRESENTED IN THE PATH OF EXTENSIONS ON CHARACTER RACK (4). THIS WILL LIMIT REARWARD TRAVEL OF CHARACTER RACK (4) TO ROTATE CHARACTER PRINTING DIAL FOR PROPER SYMBOL TO PRINT. WHEN SAID KEYS RESTORE TO NORMAL, CHARACTER SLIDES WILL BE RESTORED THROUGH SPRING TENSION.

8.6.2
DURING MULTIPLY OR DIVISION, AS U. CAM SHAFT (10) ROTATES OUT OF NORMAL, U. CAM TO CONTROL DIVISION CHARACTER (9) CONTACTS AND ROTATES CHARACTER FAN (12) TO POSITION APPROPRIATE STEPS IN PATH OF EXTENSION "C" ON CHARACTER RACK (4). THIS WILL LIMIT REARWARD TRAVEL OF RACK (4) FOR PRINTING OF MULTIPLY, DIVISION AND TOTAL SYMBOL ON THESE OPERATIONS. WHEN U. CAM SHAFT (10) RESTORES TO NORMAL, U. CAM TO CONTROL DIVISION CHARACTER (9) WILL RELEASE CHARACTER FAN (12) PERMITTING IT TO RESTORE.

8.6.3
CHARACTER RACK (4) WILL LIMIT ON SPRING STUD IN RIGHT CENTER FRAME ON BLANK STROKE BEFORE PRODUCT AND BLANK STROKE AFTER PRODUCT IN MULTIPLICATION AND REMAINDER STROKE AND BLANK STROKE AFTER QUOTIENT IN DIVISION. ALSO, CHARACTER RACK (4) WILL LIMIT ON SPRING STUD ON REMAINDER STROKE ON STOP KEY OPERATION FOR MULTIPLICATION AND DIVISION. THIS WILL PERMIT CLEARING SYMBOL TO PRINT ON THESE OPERATIONS.

IX. RECALL UNIT

9.1
THE RECALL UNIT BASICALLY IS USED TO RETAIN LAST PERTINENT PRINTED INFORMATION OR IT MAY BE USED TO STORE ANY INDIVIDUAL PRINTED INFORMATION THROUGH THE STORAGE KEY. IT IS ALWAYS DISENGEGED WHEN MACHINE IS IN NORMAL POSITION.

9.2
THE RECALL UNIT CONTAINS SEVENTEEN RECALL UNIT GEARS (13) (PLATE 7) WHICH, WHEN RECALL UNIT OPERATES, MESH WITH LOWER FRONT PORTION OF TRANSFER RACKS. RECALL UNIT DRIVE GEAR (11) ENGAGES WITH LIST UNIT AND RECALL DRIVE RACK (36) (PLATE 6) TO DRIVE TRANSFER RACKS.

RECALL UNIT LOCK PLATE (10) (PLATE 7) IS SPRING-LOADED AND LOCKS RECALL UNIT GEARS (13) WHEN RECALL UNIT IS DISENGAGED. EAR "G" ON RECALL UNIT LOCK PLATE (10) LOCKS RECALL UNIT DRIVE GEAR (11).

9.3
RECALL UNIT GEAR SHAFT (5) HAS A HIGH SURFACE "A" FOR EACH RECALL UNIT GEAR (13) WHICH CONTACTS INTERNAL EAR "H" ON RECALL UNIT GEAR (13) TO ROTATE IT TO ZERO POSITION.

9.4
COIL SPRING "F" IS TENSIONED, WHEN MACHINE IS NORMAL, SO IT WILL ROTATE RECALL UNIT GEAR SHAFT (5) TO RETURN RECALL UNIT GEARS (13) TO ZERO POSITION WHEN RECALL UNIT IS OUT OF MESH ON FORWARD STROKE.

9.5
RECALL UNIT LOCK BAR (12) SERVES AS A FIXED STOP TO LIMIT RECALL UNIT GEARS (13) FROM ROTATING BEYOND ZERO POSITION.

9.6 ITEM IN KEYBOARD

9.6.1
ON AN ADD OPERATION, AS LIST UNIT MOVES TO LEFT, ESCAPEMENT RACK (36) (PLATE 7.1) RELEASES AUTO RECALL LATCH ACTUATING YOKE (14) AND, THROUGH ARM "K" RELEASES RECALL UNIT CONTROL LATCH (15) WHICH, AT THIS TIME, ALLOWS RECALL FORWARD STROKE ACTUATOR HOOK (16) TO WITHDRAW FROM ARC OF FORWARD STROKE ACTUATING BAR (17). RECALL RETURN STROKE ACTUATOR HOOK (2) IS HELD IN POSITION BY RECALL UNIT RETURN STROKE ACTUATOR HOOK CONTROL FINGER (20).

9.6.2
ON FIRST HALF OF MAINSHAFT CYCLE, THE RECALL UNIT LOCK PLATE RELEASE DRIVE RACK (4) (PLATE 7) (WHICH OPERATES ON EVERY MAINSHAFT CYCLE) MOVES REARWARD WITH POINT "J" CAMMING RECALL LOCK PLATE LIFT CAM (7). THIS CAUSES DISENGAGEMENT OF RECALL UNIT LOCK PLATE (10) FROM RECALL UNIT GEARS (13) AND RECALL UNIT DRIVE GEAR (11) THROUGH RECALL LOCK PLATE LIFT CAM LATCH (6). AS DISENGAGEMENT OCCURS, COIL SPRING "F" WILL ROTATE RECALL UNIT GEAR SHAFT (5), WITH HIGH SURFACE "A" OF SHAFT CONTACTING INTERNAL EAR "H" ON RECALL UNIT GEARS (13), ROTATING THEM (IF ANY ARE OUT OF ZERO POSITION) UNTIL WIDE TOOTH OF GEAR LIMITS ON UNDERSIDE OF RECALL UNIT LOCK BAR (12). THIS COMPLETES THE FORWARD STROKE. THE RECALL UNIT SHAFT IS ROTATED, HAVING CLEARED AND SET RECALL UNIT GEARS TO ZERO POSITION AND TRANSFER RACKS HAVE BEEN DRIVEN TO REAR.

9.6.3
ON SECOND HALF OF MAINSHAFT CYCLE, RETURN STROKE ACTUATOR BAR (18) (PLATE 7.1) DRIVES RECALL RETURN STROKE ACTUATING HOOK (2) DOWN, PIVOTING RECALL ACTUATOR HOOK ASSEMBLY (1) AND, THROUGH RECALL ACTUATING BAIL LINK (3) (PLATE 7) ROTATES RECALL

9.6.3 (CONT'D)
UNIT ACTUATING BAIL (8). STUD "B" ON LEFT ARM OF RECALL UNIT ACTUATING BAIL (8) ROTATES RECALL UNIT LIFTING BELLCRANK (9), CAMMING RECALL UNIT UPWARD SO RECALL UNIT DRIVE GEAR (11) AND RECALL UNIT GEARS (13) ARE MESHED WITH THEIR RESPECTIVE RACKS. RECALL UNIT LOCK PLATE RELEASE DRIVE RACK (4) CONTINUES TO HOLD RECALL UNIT LOCK PLATE (10) DISENGAGED. TRANSFER RACKS, LIST UNIT, RECALL UNIT AND TRANSFER CAM SHAFT DRIVE RACK AS WELL AS RECALL UNIT LOCK PLATE RELEASE DRIVE RACK ARE DRIVEN FORWARD, ENTERING FIGURE (S) INTO RECALL UNIT GEARS (13) FROM TRANSFER RACKS WHILE RECALL UNIT DRIVE GEAR (11) AND SHAFT (5) IS RESTORED TO NORMAL THROUGH ITS RESPECTIVE RACK, AGAIN WINDING COIL SPRING "F".

9.6.4
AS RECALL UNIT LOCK PLATE RELEASE DRIVE RACK (4) REACHES ITS FORWARD LIMIT, POINT "J" RELEASES RECALL LOCK PLATE LIFT CAM (7) WHICH ALLOWS RECALL UNIT LOCK PLATE (10) TO RAISE INTO POSITION TO LOCK RECALL UNIT GEARS (13) AND DRIVE GEAR (11) WHEN RECALL UNIT WITHDRAWS. AT THIS TIME, SQUARE STUD "E" IS LIMITED ON ADJUSTING STUD "D" WHICH WILL, IN TURN, HOLD LIP ON RECALL UNIT LOCK PLATE (10) JUST CLEAR OF TEETH ON RECALL UNIT GEARS (13). THIS PREVENTS RECALL UNIT LOCK PLATE (10) DRAGGING ON TEETH OF RECALL UNIT GEARS (13) WHEN POINT "J" STARTS TO LEAVE CAMMING SURFACE OF RECALL LOCK PLATE LIFT CAM (7).

9.6.5
AS MAINSHAFT CONTINUES TO ROTATE, RETURN STROKE ACTUATING BAR RESTORES, WHICH ALLOWS RECALL ACTUATING HOOK ASSEMBLY (1) TO RESTORE AND, THROUGH MECHANICAL LINKAGE, WITHDRAW RECALL UNIT FROM TRANSFER RACKS. THIS COMPLETES THE MAINSHAFT CYCLE WITH RECALL UNIT DISENGAGED, RECALL UNIT GEAR SHAFT (5) ROTATED TO MACHINE NORMAL POSITION, RECALL UNIT LOCK PLATE (10) IN LOCKING POSITION.

9.7 NO ITEM IN KEYBOARD

9.7.1
WHEN LIST UNIT IS IN NORMAL POSITION, ESCAPEMENT RACK (36) (PLATE 7.1) CONTACTS AND ROTATES AUTO RECALL LATCH ACTUATING YOKE (14) WHICH, THROUGH ARM "K", ROTATES RECALL UNIT CONTROL LATCH (15). RECALL UNIT CONTROL LATCH (15), CONTACTING BOTH RECALL FORWARD AND RECALL RETURN STROKE ACTUATOR HOOKS (2) AND (16), WILL HOLD THESE ACTUATOR HOOKS IN POSITION TO BE ACTUATED BY FORWARD AND RETURN STROKE ACTUATING BARS (17) AND (18).

9.7.2
ON FIRST HALF OF MAINSHAFT CYCLE, AS ADD KEY IS DEPRESSED, FORWARD STROKE ACTUATING BAR (17) PULLS RECALL FORWARD STROKE ACTUATOR HOOK (16) DOWN, ROTATING RECALL ACTUATOR HOOK ASSEMBLY (1) WHICH, THROUGH RECALL ACTUATING BAIL LINK (3) (PLATE 7) ROTATES RECALL UNIT ACTUATING BAIL (8), IN TURN ROTATING RECALL UNIT LIFTING BELLCRANK (9) CAMMING RECALL UNIT UPWARD SO RECALL UNIT DRIVE GEAR (11) AND RECALL UNIT GEARS (13) ARE MESHED WITH RESPECTIVE RACKS. DURING THIS ACTION, RECALL UNIT LOCK PLATE (10) REMAINED ENGAGED WITH RECALL UNIT GEARS (13) UNTIL SQUARE STUD "E" LIMITED ON ADJUSTING STUD "D"; AT WHICH TIME, RECALL UNIT CONTINUED TRAVELING UPWARD AND, SINCE RECALL UNIT LOCK PLATE (10) CANNOT RAISE HIGHER, IT WILL COME OUT OF MESH WITH RECALL UNIT GEARS (13).

9.7.3
AT THIS TIME, RECALL UNIT LOCK PLATE RELEASE DRIVE RACK (4) TRAVELS REARWARD WITH POINT "J" CAMMING RECALL LOCK PLATE LIFT CAM (7). THIS CAUSES FULL DISENGAGEMENT OF RECALL UNIT LOCK PLATE (10) FROM RECALL UNIT GEARS (13) AND RECALL UNIT DRIVE GEAR (11). AT SAME TIME, LIST UNIT, RECALL UNIT AND TRANSFER CAM SHAFT DRIVE RACK TRAVELS REARWARD, ROTATING RECALL UNIT DRIVE GEAR (11) AND RECALL UNIT GEAR SHAFT (5).

9.7.3 (CONT'D)
HIGH SURFACE "A" ON GEAR SHAFT (5) CONTACTS INTERNAL EAR "H" ON GEAR (S) (13), CAUSING THEM TO ROTATE AND DRIVE TRANSFER RACKS REARWARD. GEARS (13) WILL CONTINUE TO ROTATE AND DRIVE TRANSFER RACKS UNTIL WIDE TOOTH "C" ON GEAR (13) LIMITS ON UNDERSIDE OF RECALL UNIT LOCK BAR (12).

9.7.4
ON SECOND HALF OF MAINSHAFT CYCLE, RETURN STROKE ACTUATING BAR TRAVELS DOWN AND PICKS UP RECALL RETURN STROKE ACTUATOR HOOK (2) WHICH HOLDS RECALL UNIT ENGAGED WITH TRANSFER RACKS DURING SECOND HALF OF CYCLE SO, AS TRANSFER RACKS ARE DRIVEN FORWARD, FIGURE (S) WILL BE RE-ENTERED INTO GEARS (13).

9.7.5
AS MAINSHAFT NEARS COMPLETION OF CYCLE, RETURN STROKE ACTUATING BAR RAISES, ALLOWING RECALL RETURN STROKE ACTUATOR HOOK (2) AND RECALL ACTUATOR HOOK ASSEMBLY (1) TO RESTORE AND, THROUGH ITS LINKAGE, RECALL UNIT RETRACTS FROM TRANSFER RACKS. THIS COMPLETES MACHINE OPERATION WITH FIGURE (S) RE-ENTERED IN RECALL UNIT AND RECALL UNIT IN NORMAL POSITION.

9.7.6
WHEN TOTAL OR SUB-TOTAL KEY IS DEPRESSED, LIST UNIT HALF-STEPS TO LEFT. THE ACTION OF RECALL UNIT IS THE SAME AS (9.6); I.E., RECALL UNIT WILL REMAIN OUT OF MESH ON FIRST HALF OF MAINSHAFT CYCLE, DURING WHICH TIME, RECALL UNIT WILL CLEAR AND WILL ENGAGE WITH TRANSFER RACKS ON SECOND HALF OF MAINSHAFT CYCLE TO RETAIN TOTAL OR SUB-TOTAL FIGURE (S). ON CONSECUTIVE TOTALS, RECALL UNIT WILL BE CLEARED ON FIRST HALF OF MAINSHAFT CYCLE AND, SINCE TRANSFER RACKS WILL NOT MOVE (ACCUMULATOR CLEARED), RECALL UNIT WILL REMAIN CLEAR ON SECOND HALF OF MAINSHAFT CYCLE.

9.8 STORAGE KEY LATCHED - ITEM IN KEYBOARD
STORAGE KEY MUST BE LATCHED DOWN AFTER MACHINE OPERATION HAS TAKEN PLACE.

9.8.1
WHEN STORAGE KEY (28) (PLATE 7.1) IS DEPRESSED, STORAGE KEY LATCH YOKE (30) ROTATES OVER STUD IN STORAGE KEY, LATCHING STORAGE KEY DOWN AND STORAGE LOCK SLIDE (29) AND STORAGE CONTROL SLIDE (27) ARE CAMMED TO REAR. STORAGE LOCK SLIDE (29) IS LATCHED BY FEATURE KEY LOCK BAR (IN TURN TRAPPING STORAGE KEY DEPRESSED) DURING ANY MACHINE OPERATION, IN THE EVENT THE OPERATOR FLICKS STORAGE KEY LATCH YOKE (30).

WHEN STORAGE CONTROL SLIDE (27) MOVES REARWARD, STORAGE CONTROL SHAFT (26) IS ROTATED THROUGH SPRING "P". THIS ROTATES STORAGE CONTROL OF RECALL UNIT CLEARING (25) AND, THROUGH STUD "M", ROTATES RECALL LOCK PLATE LIFT CAM LATCH (6) OUT OF PATH OF STEP "N" IN RECALL LOCK PLATE LIFT CAM (7); THUS RECALL UNIT LOCK PLATE (10) WILL BE DISABLED, PREVENTING RECALL UNIT GEARS FROM CLEARING WHEN RECALL UNIT LOCK PLATE RELEASE DRIVE RACK MOVES REARWARD.

9.8.2
AT SAME TIME, STORAGE SHAFT BELLCRANK (24) ROTATES REARWARD, DRIVING RECALL ACTUATOR HOOK CONTROL LINK (23) TO REAR. THIS ROTATES RECALL ACTUATOR HOOK CONTROL BELLCRANK (22) AND WITHDRAWS RECALL UNIT RETURN STROKE ACTUATOR HOOK CONTROL FINGER (20), ALLOWING RETURN STROKE ACTUATOR HOOK (2) TO MOVE OUT OF PATH OF RETURN STROKE ACTUATING BAR (18).

9.8.3
AS ADD KEY IS DEPRESSED AND MAINSHAFT ROTATES, RECALL UNIT WILL NOT BE ACTUATED BY EITHER FORWARD OR RETURN STROKE ACTUATING BAR; THEREFORE, PREVIOUSLY PRINTED FIGURE OR FIGURES WILL REMAIN IN RECALL UNIT.

9.8.4
WHEN TOTAL OR SUB-TOTAL KEYS ARE DEPRESSED, LIST UNIT IS HALF-STEPPED TO LEFT. RECALL UNIT ACTION IS SAME AS IN (9.8.3) ABOVE, I.E., RECALL UNIT GEARS WILL NOT CLEAR AND PREVIOUSLY PRINTED FIGURE (S) WILL REMAIN IN RECALL UNIT.

9.9 STORAGE KEY LATCHED - NO ITEM IN KEYBOARD

9.9.1
WHEN NO ITEMS ARE ENTERED IN KEYBOARD AND THE STORAGE KEY (28) HAS BEEN LATCHED, ESCAPEMENT RACK (36) CONTACTS AND ROTATES AUTO RECALL LATCH ACTUATING YOKE (14), ROTATING RECALL UNIT CONTROL LATCH (15) WHICH TAKES PRECEDENCE OVER RECALL UNIT RETURN STROKE ACTUATOR HOOK CONTROL FINGER (20). THUS, FOR THIS ADD OPERATION, BOTH RECALL FORWARD AND RECALL RETURN STROKE ACTUATOR HOOKS (2) AND (16) WILL REMAIN ENGAGED WITH FORWARD AND RETURN STROKE ACTUATING BARS (17) AND (18) AND RECALL UNIT WILL BE ENGAGED WITH TRANSFER RACKS ON FORWARD STROKE TO DRIVE TRANSFER RACKS ON FIRST HALF OF MAINSHAFT CYCLE AND REMAIN ENGAGED DURING SECOND HALF OF MAINSHAFT CYCLE SO TRANSFER RACKS RE-ENTER FIGURE (S).

9.9.2
ON TOTAL AND SUB-TOTAL OPERATIONS, LIST UNIT IS HALF-STEPPED TO LEFT AND ACTION OF RECALL UNIT IS SAME AS IN (9.8.3) I.E., THE FIGURE (S) WILL BE RETAINED IN RECALL UNIT.

9.10 RECALL UNIT - MULTIPLY

9.10.1
ON A MULTIPLICATION OPERATION, MULTIPLIER ENTRY WILL BE ENTERED IN RECALL UNIT AND WILL REMAIN THERE UNTIL MULT REMAINDER CYCLE. RECALL UNIT REMAINS DISENGAGED ON BOTH FIRST HALF AND SECOND HALF OF MAINSHAFT CYCLE FROM THE TIME THE MULT KEY IS DEPRESSED TO ENTER THE MULTIPLICAND UNTIL IT IS RE-ENGAGED ON BLANK STROKE (MULT REMAINDER) AND PRODUCT STROKE AND AGAIN REMAINS DISENGAGED FOR BLANK STROKE AFTER PRODUCT STROKE. IN THIS MANNER, PRODUCT IS RETAINED IN RECALL UNIT.

9.10.2
WHEN MULTIPLICAND IS ENTERED IN LIST UNIT, RECALL UNIT CONTROL LATCH (15) ROTATES AND ALLOWS RECALL FORWARD STROKE ACTUATOR HOOK (16) TO WITHDRAW FROM ARC OF FORWARD STROKE ACTUATING BAR (17). WHEN MULT KEY IS DEPRESSED, AUTO RECALL LATCH RELEASE LINK (34) WILL FALL WHEN FEATURE KEY LOCK BAR IS RELEASED AND ALLOW AUTO RECALL LATCH (35) TO DROP DOWN IN A LATCHING POSITION ON RECALL UNIT CONTROL BRACKET (19). AS MAINSHAFT ROTATES, UNIVERSAL CAM TO CONTROL DIVISION NON-PRINT (31) WILL ROTATE, CAMMING LIST UNIT FORWARD STROKE ACTUATOR HOOK MULT CONTROL SLIDE (32) TO REAR. LIP (L) ON CONTROL SLIDE (32) WILL ROTATE RECALL ACTUATOR HOOK CONTROL BELLCRANK (22), MOVING RECALL UNIT RETURN STROKE ACTUATOR HOOK CONTROL FINGER (20) FORWARD, WITHDRAWING RECALL RETURN STROKE ACTUATOR HOOK (2). RECALL FORWARD AND RECALL RETURN STROKE ACTUATOR HOOKS (2) AND (16) WILL REMAIN DISENGAGED WHEN LIST UNIT IS RETURNED TO RIGHT DUE TO AUTO RECALL LATCH (35). WHEN UNIVERSAL CAM (31) IS ROTATED FURTHER, RECALL RETURN STROKE ACTUATOR HOOK (16) MOVES REARWARD TO ENGAGE RECALL UNIT ON BLANK STROKE AND PRODUCT STROKE.

9.10.3
AS UNIVERSAL SHAFT IS AGAIN ROTATED, UNIVERSAL CAM FOR MULT RECALL CONTROL (43) (PLATE 7.2) WILL ROTATE RECALL UNIT CONTROL SHAFT (41). MULT RECALL CONTROL FINGER (37) WILL CONTACT STUD (Q) AND ROTATE STORAGE CONTROL SHAFT (26). RECALL UNIT CONTROL SHAFT (41) IS HELD IN ROTATED POSITION BY TENSION OF STUD (Q) AGAINST MULT RECALL CONTROL FINGER (37) AND LATCHING FINGER (37) OVER STUD (Q). ROTATION OF STORAGE CONTROL SHAFT (26) ROTATES RECALL ACTUATOR HOOK CONTROL BELLCRANK (22) THROUGH RECALL ACTUATOR HOOK CONTROL LINK (23) AND WITHDRAWS RECALL UNIT RETURN STROKE ACTUATOR HOOK CONTROL FINGER (20) SO RECALL UNIT WILL NOT BE ENGAGED ON SECOND HALF OF

9.10.3 (CONT'D)
MAINSHAFT CYCLE.

9.10.4
RECALL UNIT CONTROL SHAFT (41) WILL BE UNLATCHED AND RETURNED TO NORMAL BY STUD (R) IN RIGHT RACK RESET ARM (44). AS RIGHT RACK RESET ARM MOVES REARWARD, STUD (R) YIELDS MULT RECALL UNIT RELEASE CAM (39) AND, AS ARM (44) MOVES FORWARD, CONTACTS AND CAMS RELEASE CAM (39) DOWN TO RESTORE RECALL UNIT CONTROL SHAFT (41). STUD (R) CONTINUES TO MOVE FORWARD, CONTACTING MULT RECALL CONTROL LATCHING SLIDE (40) WHICH YIELDS AND PLACES TENSION ON RECALL UNIT CONTROL SHAFT (41) TO HOLD IT IN NORMAL POSITION.

9.10.5
AT THIS TIME, MULTIPLICATION PROBLEM IS COMPLETED SO FEATURE KEY LOCK BAR WILL RESTORE, RAISING AUTO RECALL LATCH RELEASE LINK (34) (PLATE 7.1) WHICH UNLATCHES AUTO RECALL LATCH (35) FROM RECALL UNIT CONTROL BRACKET (19), ALLOWING RECALL UNIT CONTROL LATCH (15) TO CAM BOTH RECALL FORWARD AND RECALL RETURN STROKE ACTUATOR HOOKS (2) AND (16) TO REAR AND NORMAL POSITION.

9.11 RECALL UNIT - DIVISION

9.11.1
RECALL UNIT ACTION FOR DIVISION IS THE SAME AS DESCRIBED IN (9.10) EXCEPT FOR DIVISION THE REMAINDER STROKE AND QUOTIENT STROKE ARE PLACED IN RECALL UNIT. THE DIVIDEND ENTRY WILL BE RETAINED IN RECALL UNIT UNTIL REMAINDER STROKE.

9.12 RECALL UNIT - REMAINDER STROKE (MULTIPLICATION)

9.12.1
IT IS NECESSARY TO KEEP RECALL UNIT RETRACTED ON FIRST HALF OF MAINSHAFT CYCLE ON A REMAINDER STROKE ON MULTIPLICATION TO PREVENT DRIVING TRANSFER RACKS FROM TWO DIFFERENT UNITS (MULT UNIT AND RECALL UNIT ON MULTIPLICATION).

9.12.2
ASSUME OPERATOR ENTERS (375) IN LIST UNIT, DEPRESSES MULTIPLY KEY TO ENTER FIGURES IN MULT UNIT, DECIDES NOT TO CONTINUE PROBLEM, IS FORCED TO DEPRESS FEATURE KEY AGAIN TO CLEAR MACHINE AND USES STOP KEY TO TERMINATE INCOMPLETED PROBLEM. SINCE LIST UNIT DID NOT MOVE TO LEFT, RECALL UNIT CONTROL LATCH (15) WOULD HOLD RECALL FORWARD STROKE ACTUATOR HOOK (16) IN POSITION TO ENGAGE FORWARD STROKE ACTUATING BAR (17) AND ENGAGE RECALL UNIT WITH TRANSFER RACKS. AT THIS TIME, TRANSFER RACKS WOULD BE DRIVEN FROM BOTH THE MULT UNIT AND RECALL UNIT, RESULTING IN A MIS-OPERATION. HOWEVER, MULT RECALL CUT-OFF LINK (33) IN THIS CASE, WILL RETRACT RECALL UNIT CONTROL LATCH (15) TO LATCHING POSITION WHEN LIST UNIT FORWARD STROKE ACTUATOR HOOK MULT CONTROL SLIDE (32) IS CAMMED REARWARD BY UNIVERSAL CAM TO CONTROL DIVISION NON-PRINT (31) WHEN IT IS ROTATED, THUS THE RECALL FORWARD STROKE HOOK (16) IS WITHDRAWN, KEEPING RECALL UNIT OUT OF MESH ON FIRST HALF OF MAINSHAFT CYCLE ON A REMAINDER STROKE OF MULTIPLICATION.

X. ACCUMULATOR UNIT

10.1
THE PRIMARY FUNCTION OF THE ACCUMULATOR UNIT IS TO ACCEPT FIGURE (S) FROM LIST UNIT, RECALL UNIT AND MULT UNIT, AS THE CASE MAY BE; STORING THEM UNTIL COMPLETION OF ADDITION OR SERIES OF ADDITIONS AND/OR SUBTRACTIONS. THE OTHER IMPROTANT FUNCTION OF THE ACCUMULATOR IS TO CAUSE FIGURE (S) THAT HAVE BEEN ACCUMULATED TO BE READ OUT AS TOTALS OR SUB-TOTALS AND TO BE PRINTED AS SUCH.

10.2
THE ACCUMULATOR UNIT PIVOTS BETWEEN RIGHT AND LEFT CENTER FRAMES AND IS NORMALLY IN A LOWERED POSITION, OUT OF MESH WITH TRANSFER RACKS. ACCUMULATOR UNIT IS DRIVEN INTO MESH WITH TRANSFER RACKS ON FIRST HALF OF MAINSHAFT CYCLE AND SPRING RESTORED OUT OF MESH WITH TRANSFER RACKS ON LAST HALF OF MAINSHAFT CYCLE (EXCEPT SUB-TOTAL OPERATIONS, WHERE UNIT REMAINS IN MESH FOR ENTIRE CYCLE).

EACH ACCUMULATING COLUMN IN ACCUMULATOR UNIT IS COMPOSED OF AN ACCUMULATOR INTERMEDIATE GEAR (6) (PLATE 8) WHICH IS CONSTANTLY MESHED WITH ADD GEAR (42) (PLATE 8.1) OR SUBTRACT GEAR (38) IN ACCUMULATOR CRADLE (17), ACCUMULATOR ACTUATOR LINK TRIP FINGER (41) THAT SETS UP ACCUMULATOR ACTUATOR LINK (12) IN CARRY POSITION, ACCUMULATOR CARRY CAM (1) WHICH IS ALIGNED WITH AND OPERATES ACCUMULATOR CAM ARM (2) TO ACTUATE ACCUMULATOR ACTUATOR LINK (12) WHEN LINK IS IN CARRY POSITION. ALSO INSTALLED WITHIN THE ACCUMULATOR UNIT IS ACCUMULATOR ACTUATOR LINK LOCK BAIL (16) WHICH LOCKS ACCUMULATOR ACTUATOR LINKS (12) AND ACCUMULATOR CARRY SEGMENTS (24) IN POSITION AFTER A CARRY OPERATION AND ACCUMULATOR ACTUATOR LINK LATCH RELEASE BAIL (9) WHICH UNLATCHES ACCUMULATOR ACTUATOR LINK LATCHES (22) FROM ACCUMULATOR ACTUATOR LINKS (12) AS ACCUMULATOR UNIT MOVES INTO MESH WITH TRANSFER RACKS.

10.3
ACCUMULATOR ACTUATOR LINK LOCK BAIL RELEASE ARM (20) PIVOTING ON STUD IN LEFT ACCUMULATOR SUPPORT PLATE (21) PERFORMS TWO FUNCTIONS, I.E., DISENGAGES ACCUMULATOR CARRY SEGMENTS (24) WITH ACCUMULATOR INTERMEDIATE GEARS (6) AS ACCUMULATOR UNIT MOVES INTO MESH WITH TRANSFER RACKS AND ENGAGES CARRY SEGMENTS (24) WITH INTERMEDIATE GEARS (6) AS ACCUMULATOR UNIT MOVES OUT OF MESH WITH TRANSFER RACKS AND RELEASES ACCUMULATOR ACTUATOR LINK LOCK BAIL (16) FROM ACCUMULATOR ACTUATOR LINKS (12), PERMITTING LINKS (12) TO RESTORE AS ACCUMULATOR UNIT MOVES INTO MESH WITH TRANSFER RACKS.

10.4
ACCUMULATOR WHEEL SECTION ACTUATOR ARMS (10) ON OUTSIDE OF LEFT AND RIGHT ACCUMULATOR SUPPORT PLATES, OPERATE ACCUMULATOR WHEEL SECTION (17), TO MESH SUBTRACT GEARS (38) WITH ACCUMULATOR INTERMEDIATE GEARS (6) ON SUBTRACT, TOTAL OR SUB-TOTAL OPERATIONS.

10.5
TOTAL BAIL (15), PIVOTING BELOW ACCUMULATOR WHEEL SECTION (17), IS PRESENTED UNDER ACCUMULATOR ACTUATOR TRIP FINGER (41) ON TOTAL OR SUB-TOTAL OPERATIONS TO HOLD TRIP FINGERS (41) IN PATH OF CARRY CAMS (C) ON ADD GEARS (42). THIS WILL LIMIT ROTATION OF ADD GEARS (42), SUBTRACT GEARS (38) AND INTERMEDIATE GEARS (6) WHICH, IN TURN, LIMITS REARWARD TRAVEL OF TRANSFER RACKS (37) ON TOTAL OR SUB-TOTAL OPERATIONS.

10.6
THERE ARE SEVERAL GUIDE COMBS WITHIN THE ACCUMULATOR UNIT TO ALIGN RELATED PARTS; I.E., ACCUMULATOR ACTUATOR LINK GUIDE COMB (27), ACCUMULATOR CAM ARM GUIDE PLATE (26) AND ACCUMULATOR ACTUATOR LINK LATCH GUIDE COMB (13).

10.7
MACHINE NORMAL AFTER TOTAL KEY DEPRESSION, ACCUMULATOR WHEELS CLEARED, ACCUMULATOR INTERMEDIATE GEARS (6) (FIGURE 1 PLATE 8.1) WILL BE OUT OF MESH WITH TRANSFER RACKS AND ACCUMULATOR CARRY SEGMENTS (24) WILL BE RAISED IN MESH WITH INTERMEDIATE GEARS (6). SUBTRACT GEARS (38) WILL BE MESHED WITH ACCUMULATOR INTERMEDIATE GEARS (6) AND CARRY CAMS (C) ON ADD GEARS (42) WILL BE JUST TO REAR OF EXTENSIONS (B) ON ACTUATOR LINK TRIP FINGERS (41). REAR EXTENSIONS (D) OF ACCUMULATOR ACTUATOR LINKS (12) WILL BE SEATED IN LOWER STEPS (E) OF ACTUATOR LINK LATCHES (22), OUT OF PATH OF ACCUMULATOR CAM ARMS (2). ACCUMULATOR CAM SHAFT (1) WILL BE IN NORMAL POSITION, RELEASED FROM HIGH POINTS (F) ON ACCUMULATOR CAM ARMS (2). ACCUMULATOR CAM SHAFT LOCK LEVER (3) (PLATE 8) WILL BE SEATED IN NOTCH OF CAM SHAFT (1) TO HOLD SHAFT IN NORMAL POSITION.

10.8 ADD KEY OPERATION
WHEN ADD KEY (47) (PLATE 8.1) IS DEPRESSED, ACCUMULATOR CONTROL SLIDE (46) IS MOVED REARWARD WHICH, IN TURN, MOVES ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (45) REARWARD, POSITIONING ACCUMULATOR SECTION ACTUATOR HOOK (28) IN PATH OF FORWARD STROKE ACTUATOR BAR.

10.8.1
AT START OF FIRST HALF OF MAINSHAFT CYCLE, ACCUMULATOR ACTUATOR LINK LATCH RELEASE BELLCRANK (51) (PLATE 8.2) WILL BE ROTATED BY MAINSHAFT CAM (50) AND, THROUGH STUD (M) ON ACCUMULATOR ACTUATOR LINK LATCH RELEASE YOKE (52) ENGAGED IN FORK ON BELLCRANK (51), ACCUMULATOR ACTUATOR LINK LATCH RELEASE YOKE (52), WILL BE ROTATED AND, THROUGH EXTENSION (N) ON YOKE (52) ACCUMULATOR ACTUATOR LINK LATCH RELEASE BAIL (9) WILL ACTUATE ACCUMULATOR ACTUATOR LINK LATCHES (22), RELEASING THEM FROM ACCUMULATOR ACTUATOR LINKS (12). ALSO AS MAINSHAFT STARTS TO ROTATE, SUBTRACT CONTROL BAIL (35) (PLATE 8.1) WILL BE ROTATED, WHICH IN TURN WILL PICK UP AND UNLATCH ACCUMULATOR SUBTRACT ACTUATOR HOOK LATCH (43) FROM SUBTRACT ACTUATOR HOOK LATCH (30). THIS WILL PERMIT ACCUMULATOR WHEEL SECTION (17) TO RESTORE TO ADD POSITION, ENGAGING ADD GEARS (42) (FIGURE 1 PLATE 8.1) WITH ACCUMULATOR INTERMEDIATE GEARS (6).

10.8.2
CONTINUED ROTATION OF MAINSHAFT CAUSES FORWARD STROKE ACTUATOR BAR TO PICK UP AND ROTATE ACCUMULATOR SECTION ACTUATOR HOOK (28). THIS, IN TURN, WILL ROTATE ACCUMULATOR ACTUATOR SHAFT (33) AND, THROUGH PIVOTING LUGS (G) AND (H) SEATED IN NOTCHES IN RIGHT AND LEFT ACCUMULATOR END PLATES (5) AND (21), ACCUMULATOR UNIT WILL BE RAISED, MESHING INTERMEDIATE GEARS (6) WITH TRANSFER RACKS (37). AT SAME TIME, ACCUMULATOR ACTUATOR LINK LOCK BAIL RELEASE ARM (20) (PLATE 8.2) IS PIVOTED DOWNWARD LOWERING ACCUMULATOR CARRY SEGMENTS (24) OUT OF MESH WITH INTERMEDIATE GEARS (6). FRONT PORTION OF ACCUMULATOR ACTUATOR LINK LOCK BAIL RELEASE ARM (20) WILL CONTACT STUD (P) AND LOWER ACCUMULATOR ACTUATOR LINK LOCK BAIL (16) BELOW STEP IN ACCUMULATOR ACTUATOR LINKS (12).

10.8.3
AS ACCUMULATOR UNIT FULLY ENGAGES TRANSFER RACKS, MAINSHAFT CAM (50) WILL RELEASE FROM ACCUMULATOR ACTUATOR LINK LATCH RELEASE BELLCRANK (51). PERMITTING BELLCRANK (51), ACTUATOR LINK LATCH RELEASE YOKE (52) AND ACCUMULATOR ACTUATOR LINK LATCH RELEASE BAIL (9) TO RESTORE TO NORMAL. THIS ACTION WILL PERMIT LOWER STEP OF ACCUMULATOR ACTUATOR LINK LATCHES (22) TO RELATCH ACCUMULATOR ACTUATOR LINKS (12) TO HOLD THEM IN NORMAL POSITION.

10.8.4
LIST UNIT, RECALL UNIT AND TRANSFER CAM SHAFT DRIVE RACK (59) WILL BE DRIVEN REARWARD. AS TRANSFER RACKS MOVE REARWARD, ACCUMULATOR INTERMEDIATE GEARS (6) AND ADD GEARS (42) WILL BE ROTATED IN DIRECTION SHOWN ON PLATE 8.2 SAME NUMBER OF SPACES THAT WERE INDEXED IN LIST UNIT GEARS. AS LIST UNIT, RECALL UNIT AND TRANSFER CAM SHAFT DRIVE RACK (59) MOVES REARWARD, ACCUMULATOR CAM SHAFT DRIVE GEAR (58) WILL BE ROTATED NINE TEETH, WHICH, IN TURN, ROTATES ACCUMULATOR CAM DRIVE GEAR (25) 360° CAUSING CAMMING SURFACE (T) OF GEAR (25) TO INTERLOCK WITH CAMMING SURFACE (V) ON TRANSFER CAM SHAFT (1) THROUGH SPRING (S).

10.8.5
AT START OF LAST HALF OF MAINSHAFT CYCLE, FORWARD STROKE ACTUATOR BAR WILL RELEASE FROM ACCUMULATOR SECTION ACTUATOR HOOK (28) (PLATE 8.1), PERMITTING HOOK (28) TO RESTORE. THIS ACTION WILL ROTATE ACCUMULATOR ACTUATOR SHAFT (33) AND, THROUGH PIVOTING LUGS (G) AND (H), ACCUMULATOR UNIT WILL BE LOWERED, DISENGAGING INTERMEDIATE GEARS (6) FROM TRANSFER RACKS.

10.8.6
AS ACCUMULATOR UNIT IS LOWERED, ACCUMULATOR ACTUATOR LINK LOCK BAIL RELEASE ARM (20) (PLATE 8.2) WILL BE PIVOTED UPWARD, RELEASING ACCUMULATOR ACTUATOR LINK LOCK BAIL (16), ALLOWING IT TO RAISE AND ACCUMULATOR CARRY SEGMENTS (24) WILL BE RAISED TO MESH WITH ACCUMULATOR INTERMEDIATE GEARS (6). ACCUMULATOR CARRY SEGMENTS (24) AT THIS TIME, SERVE AS A DETENT TO HOLD INTERMEDIATE GEARS (6) SUBTRACT AND ADD GEARS (38) AND (42) FROM TURNING.

10.8.7
ON CONTINUED ROTATION OF MAINSHAFT, TRANSFER RACKS AND LIST UNIT, RECALL UNIT AND TRANSFER CAM SHAFT DRIVE RACK (59) WILL BE DRIVEN FORWARD TO NORMAL POSITION. AS DRIVE RACK MOVES FORWARD, ACCUMULATOR CAM SHAFT DRIVE GEAR (58) WILL BE ROTATED NINE TEETH WHICH, IN TURN, ROTATES ACCUMULATOR CAM DRIVE GEAR (25) 360° AND, SINCE CAMMING SURFACE (T) IS INTERLOCKED WITH CAMMING SURFACE (V), TRANSFER CAM SHAFT (1) WILL BE ROTATED 360°. AS CAM SHAFT STARTS TO ROTATE, FRONT END OF LOCK BAIL ACTUATOR (57) WILL BE RELEASED FROM ACCUMULATOR ACTUATOR LINK LOCK BAIL (16). CONTINUED ROTATION OF TRANSFER CAM SHAFT (1) WILL CAUSE TRANSFER CAMS TO CONTACT HIGHPOINTS AND ROTATE ACCUMULATOR CAM ARMS (2). THIS, IN TURN, WILL ACTUATE ACCUMULATOR ACTUATOR LINKS (12) AND ACCUMULATOR CARRY SEGMENTS (24) TO CAUSE A SUBSEQUENT TRANSFER FROM RIGHT TO LEFT.

NOTE: OPERATION OF ACCUMULATOR ACTUATOR LINKS (12) AND ACCUMULATOR CARRY SEGMENTS (24) WILL ONLY OCCUR IF ACCUMULATOR ACTUATOR LINKS (12) ARE IN CARRY POSITION.

10.8.8
WHEN HIGH POINTS OF ALL ACCUMULATOR CAM ARMS (2) ARE RESTING ON ALL ACCUMULATOR CAMS (1) AND JUST BEFORE CAMS RELEASE CAM ARMS (2), FRONT END OF LOCK BAIL ACTUATOR (57) WILL CONTACT ACCUMULATOR ACTUATOR LINK LOCK BAIL (16) TO SECURELY HOLD BAIL (16) IN RAISED POSITION TO LOCK ACCUMULATOR ACTUATOR LINKS (12) AND ACCUMULATOR CARRY SEGMENTS (24) IN CARRY POSITION IF ANY LINKS (12) HAVE BEEN ACTUATED.

10.8.9
WHEN ACCUMULATOR CAM SHAFT (1) REACHES HOME POSITION, ACCUMULATOR CAM SHAFT LOCK LEVER (3) WILL ENTER NOTCH IN SHAFT (1) TO PREVENT SHAFT FROM OVERTHROWING. ALSO, AT THIS TIME, EXTENSION ON RECALL UNIT LOCK PLATE DRIVE RACK WILL BE POSITIONED OVER LOCK LEVER (3) TO SECURELY LOCK CAM SHAFT (1) IN HOME POSITION.

10.8.10
AT THE END OF MAIN SHAFT CYCLE, WHEN FEATURE KEY LOCK BAR IS RESTORED, ADD KEY WILL RESTORE, PERMITTING ACCUMULATOR CONTROL SLIDE (46) (PLATE 8.1) AND ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (45) TO MOVE FORWARD TO WITHDRAW ACCUMULATOR SECTION ACTUATOR HOOK (28) FROM THE PATH OF FORWARD STROKE ACTUATOR BAR.

10.8.11
IF THE SUM OF LISTED ITEMS EXCEEDS NINE IN ANY ONE ADD GEAR (42), A CARRY-OVER WILL OCCUR IN THE NEXT COLUMN TO LEFT. FOR EXAMPLE -- IF 88 AND 22 WERE ADDED TO UNITS AND TENS COLUMNS, A CARRY-OVER WOULD OCCUR IN TENS COLUMN AND HUNDREDS COLUMN TO PRODUCE A TOTAL OF 110.

10.9
WHEN ITEMS 88 AND 22 ARE ACCUMULATED, THE OPERATION WILL BE BASICALLY THE SAME AS EXPLAINED IN SECTION 10.8 EXCEPT FOR THE FOLLOWING DIFFERENCES:

10.9.1
ON FIRST HALF OF MAINSHAFT CYCLE, AS UNITS AND TENS TRANSFER RACKS ARE DRIVEN REARWARD TO ACCUMULATE 22, ACCUMULATOR INTERMEDIATE GEARS (6) (PLATE 8.2) AND ADD GEARS (42) WILL BE ROTATED. AS UNITS ADD GEAR (42) IS ROTATED FROM NINE TO ZERO, CARRY CAM WILL CONTACT EXTENSION "Q" ON TENTH COLUMN ACTUATOR LINK TRIP FINGER (41) WHICH CONTACTS AND PIVOTS TENTH COLUMN ACCUMULATOR ACTUATOR LINK (12), LATCHING LINK IN UPPER STEP OF TENTH COLUMN ACCUMULATOR ACTUATOR LINK LATCH (22). THIS WILL POSITION REAR PORTION OF TENTH COLUMN ACCUMULATOR ACTUATOR LINK (12) IN PATH OF TENTH COLUMN ACCUMULATOR CAM ARM (2). LIKEWISE, WHEN TENTH COLUMN ADD GEAR (42) ROTATES FROM NINE TO ZERO, CARRY CAM WILL CONTACT EXTENSION "R" ON HUNDREDTH COLUMN ACTUATOR LINK TRIP FINGER (41), LOWERING IT; WHICH, IN TURN, CONTACTS AND PIVOTS HUNDREDTH COLUMN ACCUMULATOR ACTUATOR LINK (12), LATCHING LINK IN UPPER STEP OF HUNDREDTH COLUMN ACCUMULATOR ACTUATOR LINK LATCH (22). THIS POSITIONS REAR PORTION OF HUNDREDTH COLUMN ACCUMULATOR ACTUATOR LINK (12) IN PATH OF HUNDREDTH COLUMN CAM ARM (2).

10.9.2
AT START OF LAST HALF OF MAINSHAFT CYCLE, ACCUMULATOR INTERMEDIATE GEARS (6) WILL DISENGAGE FROM TRANSFER RACKS AND ACCUMULATOR CARRY SEGMENTS (24) WILL ENGAGE ACCUMULATOR INTERMEDIATE GEARS (6). THROUGH CONTINUED ROTATION OF MAINSHAFT, TRANSFER RACKS AND LIST UNIT, RECALL UNIT AND ACCUMULATOR CAM SHAFT DRIVE RACK (59) WILL BE DRIVEN FORWARD TO NORMAL POSITION. AS DRIVE RACK (59) IS DRIVEN FORWARD, ACCUMULATOR CAM SHAFT (1) WILL BE ROTATED, CAUSING TENTH COLUMN ACCUMULATOR CARRY CAM (49) TO CONTACT AND ROTATE TENTH COLUMN ACCUMULATOR CAM ARM (2) WHICH WILL PICK UP AND DRIVE TENTH COLUMN ACCUMULATOR ACTUATOR LINK (12) REARWARD. THIS ACTION WILL PIVOT TENTH COLUMN CARRY SEGMENT (24) WHICH WILL ROTATE TENTH COLUMN ACCUMULATOR INTERMEDIATE GEAR (6) ONE TOOTH, ACCUMULATING ONE IN THIS COLUMN. AS ACCUMULATOR CAM SHAFT (1) IS ROTATED FURTHER, HUNDREDTH COLUMN CARRY CAM (48) WILL PICK UP AND ROTATE HUNDREDTH COLUMN ACCUMULATOR CAM ARM (2) WHICH WILL PICK UP AND DRIVE HUNDREDTH COLUMN ACCUMULATOR ACTUATOR LINK (12) REARWARD. THIS ACTION WILL PIVOT HUNDREDTH COLUMN CARRY SEGMENT (24) ROTATING HUNDREDTH COLUMN ACCUMULATOR INTERMEDIATE GEAR (6) AND ADD GEAR (42) ONE TOOTH, ACCUMULATING ONE IN THIS COLUMN.

10.9.3
WHEN ACCUMULATOR CAM SHAFT (1) NEARS HOME POSITION AND, WITH ALL ACCUMULATOR CAM ARMS (2) RESTING ON ACCUMULATOR CAMS (1), LOCK BAIL ACTUATOR (57) WILL BE RELEASED. FRONT END OF ACTUATOR (57) WILL CONTACT LOCK BAIL (16) TO SECURELY HOLD BAIL (16) IN RAISED POSITION TO LOCK TENTH AND HUNDREDTHS ACTUATOR LINK (12) AND CARRY SEGMENTS (24) IN CARRY POSITION. THIS WILL PREVENT ACTUATOR LINKS (12)

10.9.3 (CONT'D)
AND CARRY SEGMENTS (24) FROM RESTORING TO THEIR FORMER POSITION, THEREBY LOSING THE CARRY THAT WAS JUST ACCOMPLISHED. THIS COMPLETES A CARRY OPERATION.

10.9.4
ON NEXT MACHINE OPERATION, AT START OF MAINSHAFT CYCLE, ACCUMULATOR ACTUATOR LINK LATCH RELEASE BELLCRANK (51) WILL ROTATE ACCUMULATOR ACTUATOR LINK LATCH RELEASE YOKE (52) WHICH WILL ROTATE ACCUMULATOR ACTUATOR LINK LATCH RELEASE BAIL (9) TO RELEASE ACCUMULATOR ACTUATOR LINK LATCHES (22) FROM ACCUMULATOR ACTUATOR LINKS (12), THROUGH CONTINUED ROTATION OF MAINSHAFT, ACCUMULATOR UNIT IS MOVED INTO MESH WITH TRANSFER RACKS, CAUSING ACCUMULATOR ACTUATOR LINK LOCK BAIL RELEASE ARM (20) TO LOWER ACCUMULATOR CARRY SEGMENTS (24) OUT OF MESH WITH ACCUMULATOR INTERMEDIATE GEARS (6) AND UNLATCH ACCUMULATOR ACTUATOR LINK LOCK BAIL (16) FROM ACCUMULATOR ACTUATOR LINKS (12). THIS RESTORES ACTUATOR LINKS (12) AND CARRY SEGMENTS (24) TO NORMAL.

10.10 SUBTRACT KEY OPERATION

10.10.1
WHEN SUBTRACT KEY IS DEPRESSED, ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (45) (PLATE 8.1) IS MOVED REARWARD POSITIONING ACCUMULATOR SECTION ACTUATOR HOOK (28) IN PATH OF FORWARD STROKE ACTUATOR BAR. TOTAL STROKE SUBTRACT CONTROL SLIDE (63) (PLATE 8.3) IS ALSO MOVED REARWARD, POSITIONING SUBTRACT ACTUATOR HOOK (29) IN PATH OF FORWARD STROKE ACTUATOR BAR. SLIDE (63) MOVES ACCUMULATOR SUBTRACT ACTUATOR HOOK CONTROL LINK (62) REARWARD TO ALLOW ACCUMULATOR SUBTRACT ACTUATOR HOOK LATCH (43) TO LATCH SUBTRACT ACTUATOR HOOK LATCH (30) ON FIRST HALF OF MAINSHAFT CYCLE.

10.102
THE FIRST HALF OF MAINSHAFT CYCLE WILL BE THE SAME AS PREVIOUSLY EXPLAINED UNDER ADD KEY OPERATION (SECTIONS 10.8.1 THROUGH 10.8.3) EXCEPT ACCUMULATOR SECTION IS SHIFTED TO PLACE SUBTRACT GEARS (38) (PLATE 8.1) IN MESH WITH ACCUMULATOR INTERMEDIATE GEARS (6).

10.10.3
AT START OF FIRST HALF OF MAINSHAFT CYCLE, FORWARD STROKE ACTUATOR BAR WILL PICK UP AND ROTATE ACCUMULATOR SECTION ACTUATOR HOOK (28) AND SUBTRACT ACTUATOR HOOK (29). AS ACCUMULATOR SECTION ACTUATOR HOOK (28) IS ROTATED, ACCUMULATOR UNIT IS RAISED, PLACING ACCUMULATOR INTERMEDIATE GEARS (6) IN MESH WITH TRANSFER RACKS. AS SUBTRACT ACTUATOR HOOK (29) IS ROTATED, SUBTRACT ACTUATOR HOOK LATCH (30) WILL BE LOWERED WHICH WILL ROTATE ACCUMULATOR SECTION SUBTRACT ACTUATOR YOKE (36) AND, THROUGH ACCUMULATOR SECTION SUBTRACT ACTUATOR LINK (31), ACCUMULATOR SECTION ACTUATOR ARMS (10) WILL BE RAISED, SHIFTING ACCUMULATOR WHEEL SECTION (17), PLACING SUBTRACT GEARS (38) IN MESH WITH ACCUMULATOR INTERMEDIATE GEARS (6). WHEN SUBTRACT ACTUATOR HOOK (29) IS FULLY ROTATED, LOWERING SUBTRACT ACTUATOR HOOK LATCH (30) ITS MAXIMUM, ACCUMULATOR SUBTRACT ACTUATOR HOOK LATCH (43) WILL MOVE OVER STEP IN SUBTRACT ACTUATOR HOOK LATCH (30).

10.10.4
WHEN TRANSFER RACKS MOVE REARWARD, ACCUMULATOR INTERMEDIATE GEARS (6) (PLATE 8.2) WILL BE ROTATED AND, SINCE SUBTRACT GEARS (38) ARE MESHED WITH INTERMEDIATE GEARS (6), ADD GEARS (42) WILL BE ROTATED IN OPPOSITE DIRECTION AS SHOWN. THE OPERATION OF LIST UNIT, RECALL UNIT AND TRANSFER CAM SHAFT DRIVE RACK (59) AND ACCUMULATOR CAM SHAFT (1) WILL BE THE SAME AS PREVIOUSLY EXPLAINED (SECTION 10.8.4).

10.10.5
AT START OF LAST HALF OF MAINSHAFT CYCLE, FORWARD STROKE ACTUATOR BAR WILL RELEASE FROM ACCUMULATOR SECTION ACTUATOR HOOK (28) (PLATE 8.1) AND SUBTRACT ACTUATOR HOOK (29), PERMITTING ACCUMULATOR SECTION ACTUATOR HOOK (28) AND ACCUMULATOR UNIT TO RESTORE, DISENGAGING ACCUMULATOR INTERMEDIATE GEARS (6) FROM TRANSFER RACKS. AT THIS TIME, ACCUMULATOR SUBTRACT ACTUATOR HOOK LATCH (43) WILL LATCH SUBTRACT ACTUATOR HOOK LATCH (30) IN A DOWNWARD POSITION TO HOLD ACCUMULATOR WHEEL SECTION (17) IN SUBTRACT POSITION TO KEEP SUBTRACT GEARS (38) IN MESH WITH ACCUMULATOR INTERMEDIATE GEARS (6). THIS IS NECESSARY IN THE EVENT A CARRY OPERATION TAKES PLACE ON THIS CYCLE SO THE CARRY WILL BE ACCUMULATED TO THE SUBTRACT GEARS (38) WHICH, IN TURN, TAKES AWAY FROM THE ADD GEARS (42).

10.10.6
COMPLETION OF LAST HALF OF MAINSHAFT CYCLE IS THE SAME AS EXPLAINED UNDER ADD KEY OPERATION (SECTION 10.8.6 THROUGH 10.8.9).

10.10.7
AT END OF MAINSHAFT CYCLE, WHEN FEATURE KEY LOCK BAR IS RESTORED, SUBTRACT KEY WILL RESTORE, PERMITTING ACCUMULATOR CONTROL SLIDE (45) AND TOTAL STROKE SUBTRACT CONTROL SLIDE (63) (PLATE 8.3) TO MOVE FORWARD TO WITHDRAW ACCUMULATOR SECTION ACTUATOR HOOK (28) AND SUBTRACT FORWARD STROKE ACTUATOR HOOK (29) FROM THE PATH OF FORWARD STROKE ACTUATOR BAR. ALSO, AS SLIDE (63) (PLATE 8.3) MOVES FORWARD, SUBTRACT ACTUATOR HOOK CONTROL LINK (62) WILL RETRACT FROM SUBTRACT ACTUATOR HOOK LATCH (43).

10.10.8
CARRY OPERATION WILL BE PERFORMED IN THE SAME MANNER AS EXPLAINED IN ADD KEY OPERATION (SECTIONS 10.9.1 THROUGH 10.9.4).

10.11
ON NEXT MACHINE OPERATION, AT START OF MAINSHAFT CYCLE, SUBTRACT CONTROL BAIL (35) WILL BE ROTATED WHICH, IN TURN, WILL PICK UP AND UNLATCH ACCUMULATOR SUBTRACT ACTUATOR HOOK LATCH (43) FROM SUBTRACT ACTUATOR HOOK LATCH (30). THIS WILL PERMIT ACCUMULATOR WHEEL SECTION (17) (PLATE 8.1) TO RESTORE TO ADD POSITION, ENGAGING ADD GEARS (42) WITH ACCUMULATOR INTERMEDIATE GEARS (6). THIS IS NECESSARY IF THE NEXT OPERATION WAS AN ADD OPERATION. IF NEXT OPERATION WAS A SUBTRACT, TOTAL OR SUB-TOTAL OPERATION, SUBTRACT GEARS (38) WILL REMAIN IN MESH WITH INTERMEDIATE GEARS (6). AT START OF MAINSHAFT CYCLE, THUS, WE CAN CONCLUDE THAT ACCUMULATOR WHEEL SECTION (17) WILL BE IN SUBTRACT POSITION AFTER A SUBTRACT, TOTAL OR SUB-TOTAL OPERATION.

10.12 TOTAL KEY OPERATION
WHEN TOTAL KEY IS DEPRESSED, TOTAL AND SUB-TOTAL SLIDE (64) (PLATE 8.3) IS MOVED REARWARD WHICH, IN TURN, MOVES TOTAL STROKE SUBTRACT CONTROL SLIDE (63) REARWARD THROUGH SQUARE STUD "64A" ON SLIDE (64) CONTACTING TOTAL SLIDE ACTUATOR LATCH (66) MOUNTED ON SLIDE (63). THIS WILL POSITION SUBTRACT ACTUATOR HOOK (29) IN PATH OF FORWARD STROKE ACTUATOR BAR TO PLACE ACCUMULATOR WHEEL SECTION IN SUBTRACT POSITION.

10.12.1
LOWER EXTENSION OF TOTAL AND SUB-TOTAL SLIDE (64) WILL MOVE TOTAL BAIL CONTROL ARM LINK (65) TO REAR, PIVOTING TOTAL BAIL CONTROL SHAFT CAM (69) WHICH CAMS TOTAL BAIL CONTROL STUD ARM (68) TO LEFT, PLACING STUD "68A" IN PATH OF TOTAL BAIL EXTENSION (14). ALSO, AS SLIDE (64) MOVES REARWARD, TOTAL DRIVE RACK ACTUATOR FINGER LINK (67) WILL ROTATE TOTAL DRIVE RACK ACTUATOR YOKE (70) WHICH RELEASES TOTAL DRIVE RACK ACTUATOR FINGER (71), PERMITTING FINGER TO ENGAGE LUG "53A" ON TOTAL DRIVE RACK (53).

10.12.2
WHEN TOTAL STROKE SUBTRACT CONTROL SLIDE (63) IS MOVED REARWARD, ACCUMULATOR SUBTRACT ACTUATOR HOOK CONTROL LINK (62) MOVES REARWARD, RELEASING ACCUMULATOR SUBTRACT ACTUATOR HOOK LATCH (43) TO ALLOW IT TO LATCH SUBTRACT ACTUATOR HOOK LATCH (30) ON FIRST HALF OF MAINSHAFT CYCLE.

10.12.3
ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (45) (PLATE 8.1) IS MOVED REARWARD TO POSITION ACCUMULATOR SECTION FORWARD STROKE HOOK (28) IN PATH OF FORWARD STROKE ACTUATOR BAR TO ENGAGE ACCUMULATOR UNIT WITH TRANSFER RACKS ON FIRST HALF OF CYCLE.

10.12.4
HALF-STEP CONTROL SLIDE (81) (PLATE 8.4) IS MOVED REARWARD WHICH CONTACTS AND ROCKS HALF-STEP BAIL (79), CAUSING LEFT EXTENSION 79A OF BAIL (79) TO CONTACT STUD "77A" AND MOVE ZERO ESCAPEMENT ACTUATOR LINK (77) TO REAR. AS LINK (77) MOVES TO REAR, IT WILL ROTATE ZERO KEY ESCAPEMENT BAIL (82) WHICH WILL DRIVE ZERO ESCAPEMENT SLIDE (83) REARWARD TO ENGAGE HALF-STEP YOKE (75) WITH ESCAPEMENT RACK (76). ALSO, AS ZERO ESCAPEMENT ACTUATOR LINK (77) MOVES TO REAR, IT WILL WITHDRAW ESCAPEMENT FINGER (78) FROM ESCAPEMENT RACK (76), PERMITTING LIST UNIT TO MOVE ONE-HALF SPACE TO LEFT, LIMITING ON HALF-STEP YOKE (75) WHICH LIMITS ON HALF-STEP YOKE LIMIT LINK (74). THIS PLACES LIST UNIT GEARS BETWEEN TRANSFER RACKS IN THE EVENT LIST UNIT WAS TO THE LEFT AT TIME TOTAL KEY WAS DEPRESSED, PREVENTING LIST UNIT GEARS DRIVING TRANSFER RACKS. IF LIST UNIT WAS NORMAL AT THE TIME TOTAL KEY WAS DEPRESSED, ESCAPING LIST UNIT ONE-HALF SPACE TO LEFT, WILL WITHDRAW RECALL FORWARD STROKE ACTUATOR HOOK TO KEEP RECALL UNIT DISENGAGED FROM TRANSFER RACKS ON FIRST HALF OF CYCLE TO ALLOW RECALL UNIT GEARS TO CLEAR OUT LAST LISTED ITEM.

10.12.5
AT START OF FIRST HALF OF MAINSHAFT CYCLE, FORWARD STROKE ACTUATOR BAR WILL PICK UP AND ROTATE ACCUMULATOR SECTION ACTUATOR HOOK (28) (PLATE 8.1) AND SUBTRACT ACTUATOR HOOK (29). AS ACCUMULATOR SECTION ACTUATOR HOOK (28) IS ROTATED, ACCUMULATOR UNIT IS RAISED, PLACING ACCUMULATOR INTERMEDIATE GEARS (6) (PLATE 8.2) IN MESH WITH TRANSFER RACKS AND SUBTRACT DRIVE RATCHET GEAR (55) IN MESH WITH TOTAL DRIVE RACK (53). AS SUBTRACT ACTUATOR HOOK (29) (PLATE 8.1) IS ROTATED, SUBTRACT ACTUATOR HOOK LATCH (30) WILL BE LOWERED WHICH ROTATES ACCUMULATOR SECTION SUBTRACT ACTUATOR YOKE (36) AND, THROUGH ACCUMULATOR SECTION SUBTRACT ACTUATOR LINK (31), ACCUMULATOR SECTION ACTUATOR ARMS (10) WILL BE RAISED, SHIFTING ACCUMULATOR WHEEL SECTION, PLACING SUBTRACT GEARS (38) IN MESH WITH ACCUMULATOR INTERMEDIATE GEARS (6) AND SUBTRACT GEAR SHAFT DRIVE GEAR (56) (PLATE 8.2) IN MESH WITH SUBTRACT GEAR DRIVE RATCHET GEAR (54). WHEN SUBTRACT ACTUATOR HOOK (29) (PLATE 8.1) IS FULLY ROTATED, LOWERING SUBTRACT ACTUATOR HOOK LATCH (30) ITS MAXIMUM, ACCUMULATOR SUBTRACT ACTUATOR HOOK LATCH (43) WILL MOVE OVER STEP IN ACCUMULATOR SUBTRACT ACTUATOR HOOK LATCH (30).

10.12.6
AS ACCUMULATOR UNIT MOVES INTO MESH, TOTAL BAIL EXTENSION (14) (PLATE 8.3) WILL CONTACT STUD "68A" ON TOTAL BAIL CONTROL STUD ARM (68), PIVOTING TOTAL BAIL (15) (FIGURE 1 PLATE 8.1) UNDER ACTUATOR LINK TRIP FINGERS (41).

10.12.7
ALSO ON FIRST HALF OF MAINSHAFT CYCLE, FORWARD STROKE ACTUATOR BAR WILL ROTATE LIST UNIT FORWARD STROKE ACTUATOR HOOK TO LOWER LIST UNIT TO ALLOW ESCAPEMENT YOKE RELEASE "Y" (PLATE 8.4) TO MOVE OVER LIP ON DIGIT KEY RELEASE RACK (80).

10.12.8
AS MAINSHAFT CONTINUES TO ROTATE, TOTAL DRIVE RACK (53) (PLATE 8.2) WILL BE DRIVEN REARWARD. AS TOTAL DRIVE RACK (53) MOVES REARWARD, SUBTRACT GEAR DRIVE RATCHET GEAR (54) WILL BE ROTATED, ROTATING SUBTRACT GEAR SHAFT DRIVE GEAR (56) AND SUBTRACT GEAR SHAFT (39). SUBTRACT GEAR SHAFT KEY (40) (PLATE 8.6), WILL BE CARRIED AROUND THE OUTSIDE CIRCUMFERENCE OF SUBTRACT GEAR SHAFT (39), CAUSING CAMMING POINT "K" TO LEAVE DWELL "J" IN RIGHT ACCUMULATOR WHEEL SECTION END PLATE (17) AND BE URGED TOWARDS ITS AXIS BY INSIDE CIRCUMFERENCE OF BEARING SURFACE IN END PLATE. THIS CAUSES GEAR SHAFT KEY (40) TO ROCK, RAISING DRIVING EDGE OUT OF GROOVE IN SUBTRACT GEAR SHAFT (39) AND INTO POSITION TO INTERCEPT INTERNAL EARS "A" ON SUBTRACT GEARS (38).

10.12.9
SUBTRACT GEAR SHAFT (39) AND GEAR SHAFT KEY (40) WILL CONTINUE TO ROTATE AND, IN TURN, ROTATE ANY SUBTRACT GEARS (38) THAT ARE OUT OF NORMAL. ROTATION OF SUBTRACT GEARS (38) WILL ROTATE ACCUMULATOR INTERMEDIATE GEARS (6) (PLATE 8.1) AND ADD GEARS (42). ROTATION OF INTERMEDIATE GEARS (6) WILL IMPART REARWARD MOTION TO TRANSFER RACKS.

10.12.10
TOTAL DRIVE RACK (53) (PLATE 8.2) WILL CONTINUE TO BE DRIVEN REARWARD, CAUSING SUBTRACT DRIVE GEAR (56) AND SUBTRACT GEAR SHAFT (39) TO ROTATE 360° WHICH, IN TURN, ROTATES SUBTRACT GEARS (38) (FIGURE 1 PLATE 8.1) AND ADD GEARS (42) TO NORMAL POSITION. CARRY CAMS "C" ON ADD GEARS (42) AT THIS TIME WILL LIMIT ON EXTENSION "B" OF ACTUATOR LINK TRIP FINGERS (41) WHICH ARE LOCKED IN POSITION BY TOTAL BAIL (15) TO PREVENT TRANSFER RACKS FROM OVERTHROWING THEIR PRE-DETERMINED POSITION. AS SUBTRACT GEAR SHAFT (39) IS ROTATED TO ZERO POSITION, GEAR SHAFT KEY CAMMING POINT "K" WILL BE URGED INTO DWELL OF END PLATE (17) BY COIL SPRING "L" WHICH CAUSES DRIVING EDGE TO RETRACT INTO GROOVE OF SUBTRACT GEAR SHAFT (39).

10.12.11
AT START OF LAST HALF OF MAINSHAFT CYCLE, FORWARD STROKE ACTUATOR BAR WILL RELEASE ACCUMULATOR SECTION ACTUATOR HOOK (28), PERMITTING ACCUMULATOR UNIT TO RESTORE TO DISENGAGE ACCUMULATOR INTERMEDIATE GEARS (6) FROM TRANSFER RACKS AND TO DISENGAGE SUBTRACT GEAR DRIVE RATCHET GEAR (55) (PLATE 8.2) FROM TOTAL DRIVE RACK (53). AT THIS TIME, ACCUMULATOR SUBTRACT ACTUATOR HOOK LATCH (43) (PLATE 8.1) WILL LATCH SUBTRACT ACTUATOR HOOK LATCH (30) IN A DOWNWARD POSITION TO HOLD ACCUMULATOR WHEEL SECTION (17) IN SUBTRACT POSITION.

10.12.12
ALSO, AT START OF LAST HALF OF MAINSHAFT CYCLE, FORWARD STROKE ACTUATOR BAR WILL RELEASE LIST UNIT FORWARD STROKE ACTUATOR HOOK PERMITTING LIST UNIT TO RAISE. THIS CAUSES LIP ON DIGIT KEY RELEASE RACK (80) (PLATE 8.4) TO RAISE ESCAPEMENT YOKE RELEASE "Y" TO RELEASE HALF-STEP BAIL (79). THIS WILL PERMIT ZERO ESCAPEMENT ACTUATOR LINK (77), ZERO KEY ESCAPEMENT BAIL (82) AND ZERO ESCAPEMENT SLIDE (83) TO RESTORE TO WITHDRAW HALF-STEP YOKE (75) FROM ESCAPEMENT RACK (76) AND TO ENGAGE ESCAPEMENT FINGER (78) WITH ESCAPEMENT RACK (76). THIS ACTION IS NECESSARY TO ALLOW LIST UNIT TO RESTORE TO RIGHT.

10.12.13
AS MAINSHAFT CONTINUES TO RESTORE, TRANSFER RACKS AND TOTAL DRIVE RACK (53) (PLATE 8.2) WILL BE DRIVEN FORWARD TO NORMAL POSITION AND, SINCE RECALL UNIT IS IN MESH AT THIS TIME, TRANSFER RACK WILL ENTER TOTAL INTO RECALL UNIT GEARS.

10.12.14
AT END OF MAINSHAFT CYCLE, WHEN FEATURE KEY LOCK BAR IS RESTORED, TOTAL KEY WILL RESTORE, PERMITTING TOTAL AND SUB-TOTAL SLIDE (64) (PLATE 8.3), TOTAL STROKE SUBTRACT CONTROL SLIDE (63), ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (45) (PLATE 8.1) AND HALF-STEP CONTROL SLIDE (81) (PLATE 8.4) TO MOVE FORWARD. AS TOTAL STROKE SUBTRACT CONTROL SLIDE (63) (PLATE 8.3) MOVES FORWARD, SUBTRACT ACTUATOR HOOK (29) WILL WITHDRAW FROM PATH OF FORWARD STROKE BAR. ALSO, AS SLIDE (63) MOVES FORWARD, ACCUMULATOR SUBTRACT ACTUATOR HOOK CONTROL LINK (62) WILL RETRACT FROM SUBTRACT ACTUATOR HOOK LATCH (43). AS ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (45) (PLATE 8.1) MOVES FORWARD, ACCUMULATOR SECTION ACTUATOR HOOK (28) WILL WITHDRAW FROM PATH OF FORWARD STROKE ACTUATOR BAR. WHEN HALF-STEP CONTROL SLIDE (81) (PLATE 8.4) MOVES FORWARD, ESCAPEMENT YOKE RELEASE "Y" WILL LEAVE LIP ON DIGIT KEY RELEASE RACK (80). WHEN TOTAL AND SUB-TOTAL SLIDE (64) (PLATE 8.3) MOVES FORWARD, TOTAL BAIL CONTROL ARM LINK (65) AND TOTAL BAIL CONTROL SHAFT CAM (69) WILL RESTORE. THIS WILL PERMIT TOTAL BAIL CONTROL ARM STUD (68) TO MOVE TO RIGHT THROUGH COMPRESSION SPRING "X" TO RETRACT STUD "68A" FROM PATH OF TOTAL BAIL EXTENSION (14). SIMILARLY, AS SLIDE (64) RESTORES, TOTAL DRIVE RACK ACTUATOR FINGER LINK (67) WILL RELEASE TOTAL DRIVE RACK ACTUATOR YOKE (70) WHICH DISENGAGES TOTAL DRIVE RACK ACTUATOR FINGER (71) FROM LUG "53A" ON TOTAL DRIVE RACK (53).

10.13 SUB-TOTAL KEY OPERATION

10.13.1
WHEN SUB-TOTAL KEY IS DEPRESSED, THE FUNCTION OF TOTAL AND SUB-TOTAL SLIDE (64) (PLATE 8.3), TOTAL STROKE SUBTRACT CONTROL SLIDE (63), ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (45) (PLATE 8.1) AND HALF-STEP CONTROL SLIDE (81) (PLATE 8.4) WILL BE SAME AS PREVIOUSLY EXPLAINED UNDER TOTAL KEY OPERATION (SECTION 10.12).

10.13.2
FURTHER, AS SUB-TOTAL KEY IS DEPRESSED, LOWER PORTION OF KEYSTEM WILL CONTACT AND ROTATE SUBTRACT BAIL (73) (PLATE 8.3). LEFT EXTENSION OF BAIL (73) WILL RELEASE ACCUMULATOR SECTION ACTUATOR HOOK LATCH (44) ALLOWING IT TO PARTIALLY ROTATE UNTIL LATCHING POINT RESTS AGAINST ACCUMULATOR SECTION ACTUATOR HOOK (28). AT SAME TIME, TOTAL CONTROL STOP (72) WILL BE PARTIALLY ROTATED THROUGH STUD "W" ON ACTUATOR HOOK LATCH (44).

10.13.3
ON FIRST HALF OF MAINSHAFT CYCLE, WHEN ACCUMULATOR SECTION ACTUATOR HOOK (28) IS LOWERED, PLACING ACCUMULATOR UNIT IN MESH WITH TRANSFER RACKS, ACCUMULATOR ACTUATOR HOOK LATCH (44) WILL LATCH OVER STEP IN ACTUATOR HOOK (28). ALSO, AT THIS TIME, EXTENSION "V" OF TOTAL BAIL CONTROL STOP (72) WILL BE RAISED IN PATH OF TOTAL BAIL CONTROL STUD ARM (68).

10.13.4
ON LAST HALF OF MAINSHAFT CYCLE, ACCUMULATOR ACTUATOR HOOK LATCH (44) WILL HOLD ACCUMULATOR SECTION ACTUATOR HOOK (28) IN A LOWERED POSITION, KEEPING ACCUMULATOR UNIT IN MESH WITH TRANSFER RACKS WHILE ACCUMULATOR SUBTRACT ACTUATOR HOOK LATCH (43) WILL HOLD SUBTRACT ACTUATOR HOOK LATCH (30) IN LOWERED POSITION, KEEPING ACCUMULATOR WHEEL SECTION IN SUBTRACT POSITION.

10.13.5
ON CONTINUED ROTATION OF MAINSHAFT, TRANSFER RACKS AND TOTAL DRIVE RACK (53) (PLATE 8.2) WILL BE DRIVEN FORWARD. AS TRANSFER RACKS ARE DRIVEN FORWARD, ACCUMULATOR INTERMEDIATE GEARS (6) WILL ROTATE SUBTRACT GEARS (38) AND ADD GEARS (42) TO RE-ENTER AMOUNT INTO ACCUMULATOR UNIT. AS TOTAL DRIVE RACK (53) RESTORES, SUBTRACT DRIVE RATCHET GEAR (55) WILL RATCHET SUBTRACT GEAR DRIVE RATCHET GEAR (54) SINCE SUBTRACT GEAR SHAFT (39) IS A ONE-WAY ROTATING SHAFT.

10.13.6
NEAR END OF MAINSHAFT CYCLE, WHEN FEATURE KEY LOCK BAR RESTORES, SUB-TOTAL KEY WILL RESTORE, PERMITTING TOTAL AND SUB-TOTAL SLIDE (64) (PLATE 8.3), TOTAL STROKE SUB-TRACT CONTROL SLIDE (63), ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (45) (PLATE 8.1), HALF-STEP CONTROL SLIDE (81) (PLATE 8.4) AND SUBTRACT BAIL (73) (PLATE 8.3) TO RESTORE.

10.13.7
ACCUMULATOR SECTION ACTUATOR HOOK LATCH (44) WILL REMAIN LATCHED WITH ACCUMULATOR SECTION ACTUATOR HOOK (28), KEEPING ACCUMULATOR UNIT IN MESH AND ACCUMULATOR SUB-TRACT ACTUATOR HOOK LATCH (43) WILL REMAIN LATCHED WITH SUBTRACT ACTUATOR HOOK LATCH (30), KEEPING ACCUMULATOR WHEEL SECTION IN SUBTRACT POSITION.

10.13.8
TOTAL BAIL CONTROL STOP (72) WILL REMAIN POSITIONED, HOLDING TOTAL BAIL CONTROL STUD ARM (68) TO LEFT, KEEPING STUD "68A" IN PATH OF TOTAL BAIL EXTENSION (14). THIS IS NECESSARY TO INSURE POSITIONING TOTAL BAIL (15) ON A REPEAT SUB-TOTAL OPERATION WHEN ACCUMULATOR UNIT IS RAISED TO PREVENT DROPPING FIGURES FROM ACCUMULATOR SECTION.

10.14
IT SHOULD BE NOTED THAT ACCUMULATOR UNIT AND ACCUMULATOR WHEEL SECTION WILL REMAIN IN POSITION AT THE END OF SUB-TOTAL OPERATION AND WILL RESTORE TO NORMAL AT BEGINNING NEXT MACHINE OPERATION.

10.15 DIVISION TOTAL OPERATION (REMAINDER)
THE DIVISION TOTAL OPERATION IS TO READ OUT REMAINDER FROM ACCUMULATOR UNIT ON A REGULAR DIVISION OPERATION OR STOP KEY OPERATION. THE COMPLETE TOTAL OPERATION FOR DIVISION WILL BE THOROUGHLY EXPLAINED LATER IN TEXT OF THIS MANUAL UNDER DIVISION OPERATION SECTION.

10.16 MULT TOTAL OPERATION (PRODUCT)
THE MULT TOTAL OPERATION IS TO READ OUT THE PRODUCT FROM ACCUMULATOR UNIT. THE COMPLETE TOTAL OPERATION FOR MULT WILL BE THOROUGHLY EXPLAINED LATER IN THE TEXT UNDER MULT OPERATION SECTION.

XI. PRINTER UNIT

11.1
EACH PRINTING COLUMN CONTAINS TYPE ARM (16) OR (14) (PLATE 9) RIVETED TO TYPE SUPPORT BRACKET (7) AND TYPE LATCHES (12) OR (13) WITH TYPE ARMS MOVING REARWARD IN SLOTS OF GUIDE COMB (20) THROUGH SPRING TENSION. TWO KINDS OF TYPE ARMS ARE USED -- TYPE ARM (16) HAS DECIMAL ARM (15) LOOSELY MOUNTED ON ARM AND LAST COLUMN TYPE ARM (14) WITHOUT DECIMAL ARM (15).

11.2
TYPE ARMS ARE IN CONSTANT MESH WITH TRANSFER RACKS (11) THROUGH TYPE INTERMEDIATE GEAR (5) AND IN NORMAL POSITION ARE HELD TO FRONT BY GUIDE COMB (20). TYPE WHEEL (18) IS DETENTED IN POSITION AT ALL TIMES BY TYPE WHEEL DETENT (17).

11.3
TYPE LATCH (12) ADJACENT TO TYPE ARMS, IS MOUNTED ON TYPE LATCH SHAFT (8). INDIVIDUALLY CONTROLLED BY TRANSFER RACK (11) OR BY OVERLAPPING TAILS "K" (EXTENDING OVER TYPE LATCH (12) TO THE LEFT TO ALLOW CIPHERS TO PRINT TO RIGHT OF A SIGNIFICANT FIGURE). LAST COLUMN TYPE LATCH (13) DOES NOT HAVE OVERLAPPING TAIL "K". LOWER EXTENSION "L" LIMITS ON TRANSFER RACK (11) AND HOLDS TYPE LATCHES (12) OR (13) OUT OF NORMAL, PREVENTING IT FROM BLOCKING TYPE ARM OR ENTERS NOTCH "M" IN TRANSFER RACK (11) ALLOWING TYPE LATCHES (12) OR (13) TO ROTATE AND BLOCK TYPE ARM FROM OPERATING. TYPE LATCH SHAFT (8) HAS KEY "H" WHICH CONTROLS MOVEMENT OF TYPE LATCHES.

11.4
THE CHARACTER TYPE ASSEMBLY (6) MOUNTED ON EXTREME RIGHT, HAS NO TYPE LATCH AND PRINTS ON EVERY PRINTING STROKE.

11.5
IN NORMAL POSITION, GUIDE COMB (20) IS HELD TO FRONT. TYPE GUIDE COMB ACTUATING CAM (4) CONTACTS ROLL "E" ON REAR RACK GUIDE SHAFT (3) AND FORK IN LEFT (19) AND RIGHT (2) ARM, CONTACTING STUDS "D" AND "P" IN GUIDE COMB, HOLDING GUIDE COMB (20) AND TYPE ARMS (6), (14) AND (16) TO FRONT.

11.6
TYPE LATCHES (12) AND (13) ARE NORMALLY ROTATED TO REAR THROUGH KEY "H" ON TYPE LATCH SHAFT (8) WHICH IS HELD BY TYPE LATCH ACTUATING CAM (10) CONTACTING ROLL "F" ON RIGHT ARM (9).

11.7
TYPE FIRING PLATE (24) (FIGURE 1) RESTS ON TOP OF GUIDE COMB (20) (PLATE 9), THROUGH SPRING TENSION, IN POSITION TO INTERCEPT EAR "J" OF TYPE ARMS AND HOLD THEM FORWARD ON FIRST PORTION OF MAINSHAFT CYCLE, DURING THE TIME GUIDE COMB (20) HAS TRAVELED REARWARD. TYPE FIRING PLATE IS SHIFTED TO RIGHT DURING NON-PRINT OPERATION INTO POSITION TO INTERCEPT NON-PRINT BLOCKING EAR "C" ON GUIDE COMB (20) AND PREVENT TYPE ARMS FROM STRIKING PLATEN. IT IS SHIFTED TO RIGHT BY NON-PRINT BELLCRANK ON CORRECTION, MULTIPLY AND DIVISION. (REFER TO TEXT ON EACH SUBJECT.)

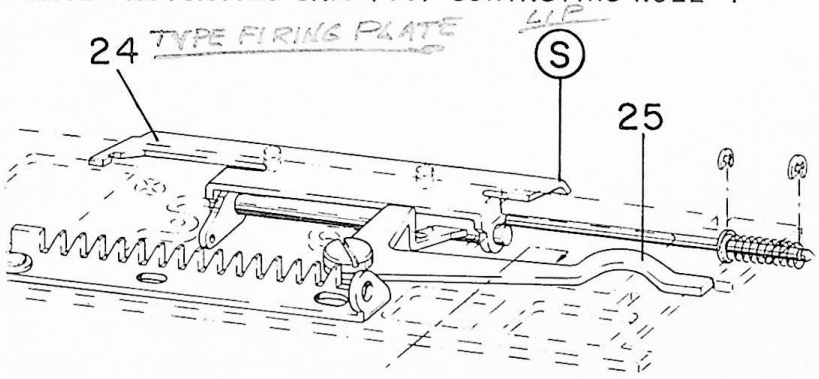


FIG. 1

NOTE: ON CORRECTION OPERATION DURING LAST HALF OF CYCLE, TYPE GUIDE COMB (20) WILL BE RELEASED BUT NO PRINTING WILL TAKE PLACE.

11.8
WHEN MAINSHAFT STARTS TO ROTATE, TYPE GUIDE COMB ACTUATING CAM (4) WILL ALLOW ROLL "E" TO MOVE TO LOW SURFACE OF CAM, PIVOTING GUIDE COMB (20) REARWARD, AWAY FROM TYPE ARMS THROUGH LEFT AND RIGHT ARMS (19) AND (2). AT THIS TIME, EARS "J" ARE LIMITING ON LIP "S" (FIGURE 1) OF TYPE FIRING PLATE (24). TRANSFER RACKS (11) (PLATE 9) WILL MOVE TO REAR, ROTATING TYPE WHEELS (18). MAINSHAFT CONTINUES TO ROTATE WITH TYPE LATCH ACTUATING CAM (10), ALLOWING TYPE LATCH SHAFT (8) TO ROTATE UNDER TENSION OF SPRING "G". AT THIS TIME, LOWER EXTENSION "L" OF TYPE LATCHES (12) OR (13) WILL EITHER LIMIT ON TOP OF TRANSFER RACKS (11) THAT TRAVELED TO REAR WHICH HOLDS HOOK ON TYPE LATCH BELOW HOOK ON TYPE ARM OR LOWER EXTENSION "L" OF TYPE LATCH WILL ENTER NOTCH IN TRANSFER RACKS (11) THAT REMAINED IN NORMAL POSITION WHICH ALLOWS HOOK ON TYPE LATCH TO RAISE INTO POSITION TO CATCH HOOK ON TYPE ARM.

AS MAINSHAFT CONTINUES TO ROTATE, TYPE GUIDE COMB ACTUATING CAM (4) ALLOWS ROLL "E" TO DROP TO LOW DWELL OF CAM, ROTATING REAR RACK GUIDE SHAFT (3) FURTHER. THIS REAR RACK GUIDE SHAFT (3) MOVEMENT DRIVES GUIDE COMB (20) FURTHER TO REAR, AT WHICH TIME, GUIDE COMB (20) CAMMING EAR "Q" CONTACTS AND LIFTS TYPE FIRING PLATE (24) (FIGURE 1) ABOVE EARS "J" (PLATE 9) ON TYPE ARMS WHICH WILL, IF NOT BLOCKED BY TYPE LATCHES (12) OR (13) MOVE REARWARD UNDER SPRING TENSION TO STRIKE PLATEN.

11.9
AS MAINSHAFT CONTINUES TO ROTATE, TYPE GUIDE COMB ACTUATING CAM (4) WILL CONTACT ROLL "E" AND RESTORE REAR RACK GUIDE SHAFT (3) WHICH, IN TURN, WILL DRIVE GUIDE COMB (20) FORWARD. GUIDE COMB WILL CONTACT AND RESTORE TYPE ARMS FORWARD SO EARS "J" ARE IN AN OVERLATCHING POSITION WITH TYPE FIRING PLATE.

11.10
NEAR END OF MAINSHAFT CYCLE, HIGH SURFACE OF TYPE LATCH ACTUATING CAM (10) WILL CONTACT ROLL "F", ROTATING TYPE LATCH SHAFT (8) AND TYPE LATCHES (12) AND (13) TO NORMAL POSITION.

XII. DECIMAL PRINTING

12.1
DECIMAL PRINTING IS CONTROLLED THROUGH ROTATION OF DECIMAL CONTROL SHAFT (21) (PLATE 9) AND LOCATION OF SELECTIVE DECIMAL LOCATOR (1).

12.2
SELECTIVE DECIMAL LOCATOR (1) WORKS IN CONJUNCTION WITH DECIMAL CONTROL SHAFT (21) THROUGH NYLON STRING "A". IN NORMAL POSITION, SELECTIVE DECIMAL LOCATOR (1) IS TO RIGHT AND IS NOT VISIBLE THROUGH COLUMN INDICATOR WINDOW IN MACHINE CASE. WHEN DECIMAL CONTROL SHAFT (21) IS RATCHETED CLOCKWISE, SELECTIVE DECIMAL LOCATOR (1) WILL MOVE TO LEFT, THROUGH SPRING "R" THROUGH POSITION OF SELECTIVE DECIMAL LOCATOR (1), OPERATOR SELECTS COLUMN THAT FIRST DECIMAL WILL BE PRINTED WHILE REMAINING DECIMALS SUB-DIVIDE PRINTING INTO GROUPS OF THREE DIGITS.

12.3
IN NORMAL POSITION, DECIMAL CONTROL SHAFT (21) IS ROTATED COUNTER-CLOCKWISE UNTIL HIGH TOOTH "B" ON DECIMAL INDICATOR DETENT PULLEY (23) LIMITS ON DETENT (22). AT THIS TIME, LOWER EAR "N" OF DECIMAL ARM (15) WILL LIMIT ON OUTSIDE RADIUS OF DECIMAL CONTROL SHAFT (21) WHEN DECIMAL ARM (15) IS CARRIED TO REAR BY TYPE ARM (16) WHICH WILL PREVENT DECIMAL ARM (15) FROM PRINTING. CLOCKWISE ROTATION OF DECIMAL CONTROL SHAFT (21) ONE DETENTED POSITION, WILL PRESENT A GROUP OF HOLES TO LOWER EAR "N" OF DECIMAL ARM (15) TO PERMIT DECIMALS TO BE PRINTED IN THE UNITS, 4TH, 7TH, 11TH, 13TH AND 16TH COLUMNS. SIMILARLY, ADDITIONAL TOOTH RATCHETING, CLOCKWISE, WILL PERMIT DECIMALS TO BE PRINTED ONE COLUMN FURTHER TO LEFT.

XIII. RIBBON

13.1

A TWO-COLOR RIBBON IS SUPPORTED IN FRONT OF PLATEN BY RIBBON GUIDE, LEFT (19) (PLATE 10) AND RIGHT (1), THROUGH RIBBON LIFT SHAFT (20). IN NORMAL POSITION, LEFT RIBBON GUIDE (19) IS RESTING DOWN ON SHAFT "D", PLACING BLACK PORTION OF RIBBON IN PRINTING POSITION. RIBBON SPOOLS ARE MOUNTED ON RIBBON SPOOL SHAFT, LEFT (3) OR RIGHT (2). WHEN RIBBON WINDS ON RIGHT RIBBON SPOOL, RIGHT END OF RIBBON REVERSE SHAFT (12) WILL BE DETENTED UP SO RIGHT RIBBON FEED PAWL (10) AND RIGHT DETENT PAWL (6) WILL ENGAGE RIGHT RATCHET GEAR (8) AND LEFT END WILL BE DOWN, DISENGAGING LEFT RIBBON FEED PAWL (13) AND LEFT DETENT PAWL (6) FROM LEFT RATCHET GEAR (9). AT THIS TIME, FINGER "A" ON LEFT RIBBON REVERSE CONTROL ASSEMBLY (5) WILL BE RESTING AGAINST FULL SPOOL OF RIBBON, BEING HELD OUTWARD SO RIBBON REVERSE SHAFT LIFT CAM LIMIT (7) IS ROTATED TO REAR OF LEFT RIBBON REVERSE SHAFT LIFT CAM (14). THE POSITIONING OF PARTS IS THE OPPOSITE (LEFT FOR RIGHT OR VICE VERSA) WHEN RIBBON IS WINDING ON LEFT RIBBON SPOOL.

13.2

OSCILLATING PLATEN FEED SHAFT (4) OPERATES RIBBON FEED BELLCRANK (18) AND, THROUGH SCREW "C", PIVOTS RIBBON FEED LINK (17). RIBBON FEED LINK (17) WILL PULL RIBBON FEED SHAFT CONNECTOR LINK (15) REARWARD, OSCILLATING RIBBON REVERSE SHAFT (12). AS RIBBON REVERSE SHAFT (12) ROTATES, RIGHT RIBBON FEED PAWL (10) WILL MOVE REARWARD AND, AS SHAFT RESTORES, PICK UP TOOTH OF RIGHT RATCHET GEAR (8) AND ROTATE IT ONE TOOTH; AT WHICH TIME, IT WILL AGAIN BE HELD BY DETENT PAWL (6). RIBBON WILL CONTINUE TO WIND ON RIGHT SPOOL, UNWINDING FROM LEFT SPOOL.

13.3

AS NUMBER OF RIBBON TURNS ON LEFT RIBBON SPOOL DIMINISHES, FINGER "A" ON LEFT RIBBON REVERSE CONTROL ASSEMBLY (5) WHICH PRESSES AGAINST RIBBON, WILL BE URGED TOWARD RIBBON AXLE THROUGH SPRING TENSION UNTIL LIFT CAM LIMIT (7) ROTATES INTO POSITION TO BLOCK LIFT CAM (14). WHEN RIBBON REVERSE SHAFT (12) ROTATES, LIFT CAM (14) WILL MOVE UPWARD AND, ON RETURN STROKE, LIMIT ON LIFT CAM LIMIT (7). THIS ACTION WILL THEN HOLD LEFT END OF RIBBON REVERSE SHAFT (12) UP; THEREFORE, RIBBON REVERSE SHAFT WILL BE FORCED TO PIVOT ON CENTRALLY LOCATED RIBBON FEED SUPPORT BRACKET (11), LOWERING RIGHT RIBBON FEED PAWL (10) WHICH WILL CONTACT LIMIT "B" ON BOTTOM PLATE, FORCING RIGHT RIBBON FEED PAWL (10) OUT OF RIGHT RATCHET GEAR (8) WITHDRAWING RIGHT DETENT PAWL (6) AND ALLOWING LEFT RIBBON FEED PAWL (13) AND DETENT PAWL (6) TO ENGAGE WITH LEFT RATCHET GEAR (9). RIBBON WILL NOW WIND ON LEFT RIBBON SPOOL.

13.4

THE RED PORTION OF RIBBON IS RAISED INTO PRINTING POSITION ON A TOTAL OR SUB-TOTAL OPERATION; OR WHEN DRIVING THE QUOTIENT FROM THE MULTIPLY UNIT IN DIVISION; OR DURING A CLEARING STROKE WHILE DRIVING THE MULTIPLY UNIT IN MULTIPLICATION. AS THE TOTAL DRIVE RACK (21) GOES TO REAR; OR AS MULTIPLY DRIVE RACK (22) GOES TO REAR, LEFT RIBBON ARM AND GUIDE (19) IS RAISED INTO RED POSITION AND THROUGH RIGHT RIBBON LIFT ARM (16) RIBBON LIFT SHAFT (20) RAISES RIGHT RIBBON LIFT ARM AND GUIDE (1).

13.5

THE PURPOSE OF RIBBON REVERSE SHAFT DETENT (23) IS TO HOLD REVERSE SHAFT (12) IN LEFT OR RIGHT DETENTED POSITION.

XIV. CARRIAGE

14.1
A 3-3/8" PLATEN (1) (PLATE 11), PLATEN KNOB (2), PLATEN ECCENTRIC BUSHINGS, RIGHT AND LEFT (4) ARE SUPPORTED BETWEEN LEFT CENTER FRAME AND RIGHT SIDE FRAME BY PLATEN FEED SHAFT (6). PLATEN DETENT (11) RESTS BETWEEN TEETH OF RATCHET GEAR "A" (PART OF PLATEN KNOB (2) AND HOLDS PLATEN (1) IN DETENTED POSITION. PLATEN ECCENTRIC BUSHINGS (4) ARE USED IN ALIGNING THE PLATEN (1) TO PRINTING WHEELS.

14.2
TWO PAPER PRESSURE ROLLS (12), IN PAPER CRADLE (13), MAINTAIN PRESSURE AGAINST THE PLATEN (1) FOR PAPER FEED. ARM "D" (EXTENDING ABOVE CASE) IS USED FOR RELEASING THE PRESSURE OF PRESSURE ROLLS (12) FROM PLATEN BY DISPLACING PAPER CRADLE (13).

14.3
IN NORMAL POSITION, PLATEN FEED PAWL (7) IS HELD OUT OF TEETH OF RATCHET GEAR "A" BY CAMMING SURFACE OF PLATEN SHAFT SUPPORT PLATE (3).

14.4
NEAR END OF MAINSHAFT CYCLE, HIGH SURFACE OF CARRIAGE FEED CAM (10) ROTATES AND PIVOTS CARRIAGE FEED BELLCRANK (9) WITH UPPER PORTION CONTACTING PLATEN FEED ARM (8), DRIVING IT FORWARD, ROTATING PLATEN SHAFT (6). AS PLATEN SHAFT ROTATES, PLATEN FEED PAWL (7) IS CARRIED UPWARD, CAUSING STUD "B" TO LEAVE CAMMING SURFACE OF PLATEN SHAFT SUPPORT PLATE (3) AND ENGAGE WITH TOOTH OF RATCHET GEAR "A"; IN TURN ROTATING PLATEN KNOB (2) AND PLATEN (1) TO NEXT DETENTED POSITION.

AS CARRIAGE FEED CAM (10) ROTATES TO HOME POSITION, CARRIAGE FEED BELLCRANK (9) WILL RESTORE THROUGH SPRING TENSION AND ALLOW PLATEN FEED ARM (8) AND PLATEN SHAFT (6) TO RESTORE THROUGH SPRING "C".

14.5
DURING ANY NON-PRINT OPERATION, I.E., CORRECTION, MULTIPLICATION OR DIVISION, PLATEN FEED ARM (8) IS URGED TO RIGHT, OUT OF PATH OF CARRIAGE FEED BELLCRANK (9).

XV. MULTIPLY UNIT AND COUNTER

15.1
MULTIPLY UNIT, WHEN IN NORMAL POSITION, IS DISENGAGED FROM TRANSFER RACKS. IT IS MOVED INTO MESH TO - - ACCEPT THE MULTIPLIER IN MULT UNIT GEARS ON MULTIPLICATION: HAVE MULT UNIT GEARS RESTORED TO ZERO POSITION ON STOP KEY OPERATION ON BLANK STROKE BEFORE PRODUCT STROKE ON MULTIPLICATION: AND CAUSE THE QUOTIENT TO BE PRINTED ON DIVISION. WHEN MULTIPLY UNIT IS IN NORMAL POSITION, MULT COUNTER FINGER (3) (PLATE 12) WILL OVERLIE A MULT UNIT GEAR (5) AND, WHEN OSCILLATED THROUGH FORWARD MOVEMENT OF #1 M & D SLIDE (24) OR #3 M & D SLIDE (26) WILL INDEX MULT UNIT GEAR (5) ONE TOOTH.

15.1.1 ENTERING MULTIPLIER IN MULTIPLY UNIT
ON FIRST DEPRESSION ON MULTIPLY KEY, U. CAM TO CONTROL MULT UNIT DRIVE RACK (12) IS ALIGNED AND ROTATED, CAMMING MULT SLIDE (11) TO REAR. THIS PLACES MULT UNIT ACTUATOR HOOK (13) IN PATH OF FORWARD STROKE ACTUATING BAR. AS MAINSHAFT CONTINUES TO ROTATE, MULT UNIT ACTUATOR HOOK (13) WILL PIVOT AND, THROUGH MULT ACTUATOR HOOK CONNECTING HOOK (14), ENGAGE MULT UNIT GEARS (5) WITH TRANSFER RACKS. AT THIS TIME, MULT UNIT LATCH (16) WILL MOVE OVER LEFT ARM (15) OF MULT UNIT.

15.1.2
TRANSFER RACKS WILL BE DRIVEN REARWARD BY LIST UNIT GEARS AND ROTATE MULT UNIT GEARS (5). WHEN MAINSHAFT ROTATES, RACK ALIGNING BLADE CONTROL SHAFT (17) WILL BE DRIVEN DOWN TO LOCK TRANSFER RACKS IN POSITION AND RELEASE MULT UNIT LATCH (16) SO WHEN FORWARD STROKE ACTUATING BAR RESTORES, MULT UNIT WILL DISENGAGE FROM TRANSFER RACKS.

15.1.3
ON SECOND DEPRESSION OF MULTIPLY KEY, DIVISOR UNIT CONTROL SHAFT (19) WILL BE ROTATED, WHICH RELEASES MULT COUNTER CONNECTOR (7) FROM MULT COUNTER HOOK (6) AND INTO ENGAGEMENT WITH MULT COUNTER CONNECTOR RACK ON LIST UNIT. THROUGH THIS ARRANGEMENT, MULT COUNTER FINGER (3) WILL BE LATERALLY ALIGNED WITH MULT UNIT GEARS THROUGH THE LATERAL POSITION OF LIST UNIT. DURING THIS MAINSHAFT CYCLE, U. CAM (12) WILL BE ROTATED FAR ENOUGH TO ALLOW MULT SLIDE (11) TO MOVE FORWARD AND WITHDRAW MULT HOOK (13) FROM PATH OF FORWARD STROKE ACTUATOR BAR.

15.2 COUNTING OUT OF MULTIPLY UNIT ON MULTIPLICATION

15.2.1
MULTIPLY UNIT REMAINS AT NORMAL (DISENGAGED FROM TRANSFER RACKS) POSITION DURING MULTIPLIER STROKES.

15.2.2
ON EACH MULTIPLIER STROKE, #3 M & D SLIDE (26) IS OPERATED, OSCILLATING MULT COUNTER SHAFT (23), MULT COUNTER SHAFT SEGMENT (22) MESHED WITH GEAR (21) ON MULT COUNTER SHAFT (20) OSCILLATES MULT COUNTER FINGER (3), CAUSING FINGER (3) TO ROTATE MULT UNIT GEAR ONE TOOTH. THUS, FOR EACH MULTIPLIER STROKE, MULT UNIT GEAR IS ROTATED, REDUCING THE MULTIPLIER ONE DIGIT AT A TIME, UNTIL EXTREME RIGHT SIGNIFICANT MULTIPLIER IS REDUCED TO ZERO.

15.2.3
WHEN MULT UNIT GEAR HAS ROTATED TO ZERO, ZERO DROP-IN FINGER (2) WILL NOW ENTER CUT IN FLANGE OF MULT UNIT GEAR (5), ALLOWING ZERO DROP-IN BAR (1) TO ROCK PARTWAY (UNTIL FINGERS "A" ON ZERO DROP-IN BAR (1) LIMIT ON FLANGES OF MULT UNIT GEARS THAT ARE NOT AT ZERO POSITION) AND THROUGH MECHANICAL LINKAGE, CAUSE LIST UNIT TO MOVE ONE SPACE TO LEFT WHERE THE COUNTING OUT PROCESS WILL AGAIN BE REPEATED. THE SEQUENCE WILL AGAIN TAKE PLACE UNTIL THE ENTIRE MULTIPLIER HAS BEEN COUNTED OUT OF MULTIPLY UNIT.

15.2.4
WHEN ZERO DROP-IN FINGER (2) AND ZERO DROP-IN BAR (1) DETECT THAT ALL MULT UNIT GEARS ARE AT ZERO POSITION, CERTAIN LINKS AND DRIVES WILL THEN ALLOW MACHINE TO PERFORM A "BLANK STROKE" BEFORE PRODUCT STROKE.

15.3 DRIVING TRANSFER RACKS WITH MULT UNIT GEARS.

15.3.1
AT START OF BLANK STROKE, BEFORE PRODUCT STROKE, U. CAM (12) WILL BE ROTATED, AGAIN CAUSING MULT SLIDE (11) TO CAM MULT HOOK (13) IN PATH OF FORWARD STROKE ACTUATING BAR SO ON THIS STROKE MULT UNIT WILL ENGAGE WITH TRANSFER RACKS. ALSO, U. CAM (27) (FIGURE 1) WILL ROTATE, ACTUATING MULT DRIVE RACK CONTROL BELLCRANK (30), RELEASING MULT DRIVE RACK ACTUATING FINGER (29), PERMITTING IT TO INTERCEPT LUG "E" ON MULT DRIVE RACK (28) DRIVING MULT DRIVE RACK (28) TO REAR.

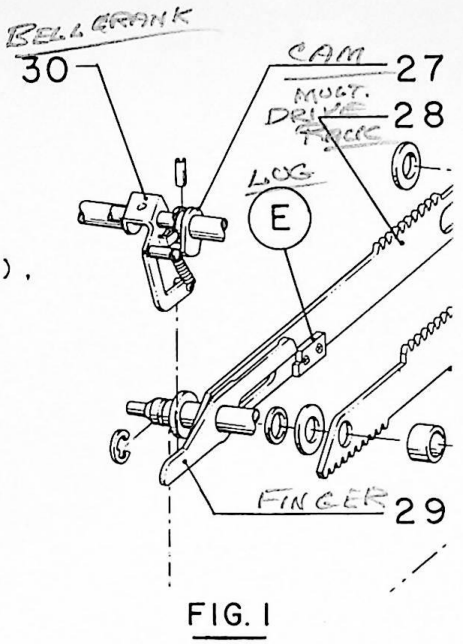


FIG. 1

15.3.2
MULT DRIVE RACK (28) WILL BE DRIVEN REARWARD, CAUSING MULT DRIVE GEAR (18) (PLATE 12) AND MULT GEAR SHAFT (10) TO ROTATE. GEAR SHAFT KEY (8) RESTING IN GROOVE OF MULT GEAR SHAFT (10) WILL NOW BE CARRIED AROUND THE OUTSIDE CIRCUMFERENCE OF MULT GEAR SHAFT (10), CAUSING CAMMING POINT "C" TO LEAVE DWELL IN GUIDE PLATE (9) AND BE URGED TOWARDS ITS AXIS BY INSIDE CIRCUMFERENCE OF BEARING SURFACE IN GUIDE PLATE (9). THIS CAUSES GEAR SHAFT KEY (8) TO ROCK, RAISING DRIVING EDGE "B" OUT OF GROOVE IN MULT GEAR SHAFT (10) AND INTO POSITION TO INTERCEPT INTERNAL EARS ON MULT UNIT GEARS (5).

15.3.3
MULT GEAR SHAFT (10) AND GEAR SHAFT KEY (8) WILL CONTINUE TO ROTATE AND CAUSE ANY MULT UNIT GEAR (5) TO ROTATE IF ANY ARE OUT OF NORMAL AND IMPART MOTION TO TRANSFER RACKS. THIS WOULD BE THE CASE IN A STOP KEY OPERATION, DURING MULTIPLICATION. SINCE THE MACHINE DID NOT REDUCE THE MULTIPLIER TO ZERO, SOME PORTION OF THE MULTIPLIER WOULD REMAIN IN MULT UNIT GEARS (5). THEREFORE, ON THIS PARTICULAR STROKE, REMAINDER OF THE MULTIPLIER WOULD BE DRIVEN OUT OF MULT UNIT. THE PRINTED FIGURES WOULD BE IN TENS COMPLIMENT TO THE REMAINING FIGURES OF THE MULTIPLIER.

15.3.4
MULT DRIVE RACK WILL CONTINUE TO BE DRIVEN REARWARD, CAUSING MULT DRIVE GEAR (18) AND MULT GEAR SHAFT (10) TO ROTATE 360° AND DRIVE MULT UNIT GEARS (5) TO ZERO POSITION. AS MULT GEAR SHAFT (10) IS ROTATED TO ZERO POSITION, GEAR SHAFT KEY (8) CAMMING POINT "C" WILL BE URGED INTO DWELL OF GUIDE PLATE (9) BY COIL SPRING "D" WHICH CAUSES DRIVING EDGE "B" TO RETRACT INTO GROOVE OF MULT GEAR SHAFT (10).

15.3.5
AS MULT DRIVE RACK (28) (PLATE 12.1) MOVED REARWARD, MULT GEAR HOOK ACTUATING LEVER (31) WILL BE CAMMED DOWN, CONTACTING MULT GEAR HOOK CONTROL ACTUATOR (32), PIVOTING MULT GEAR HOOK CONTROL BAIL (33) REARWARD, ALLOWING MULT HOOKS (34) TO ENTER NOTCH IN FLANGE OF MULT UNIT GEARS (5) TO ARREST THEM AT ZERO POSITION. WHEN RACK RESET ARMS REACH THEIR REARWARD TRAVEL, MULT GEAR HOOK CONTROL ACTUATOR (32) WILL BE ROTATED, MOVING VERTICAL ARM OUT FROM UNDER MULT GEAR HOOK ACTUATING LEVER (31). THIS WILL ALLOW MULT HOOKS (34) TO BE RESTORED BY MULT GEAR HOOK CONTROL BAIL (33). AT APPROXIMATELY THIS TIME, RACK ALIGNING BLADE CONTROL SHAFT (17) (PLATE 12) WILL BE DRIVEN DOWN TO LOCK TRANSFER RACKS IN POSITION AND RELEASE MULT UNIT LATCH (16). MAINSHAFT CONTINUES TO ROTATE TO HOME POSITION, ALLOWING FORWARD STROKE ACTUATING BAR TO RESTORE AND, THROUGH MULT UNIT ACTUATOR HOOK (13), MULT UNIT WILL DISENGAGE FROM TRANSFER RACKS. U. CAM (12) WILL BE ROTATED AT START OF NEXT MACHINE CYCLE, WITHDRAWING MULT UNIT ACTUATOR HOOK (13) FROM PATH OF FORWARD STROKE ACTUATING BAR AND U. CAM (27) (FIGURE 1) WILL ROTATE TO DISCONNECT MULT DRIVE RACK ACTUATOR FINGER (29).

15.4 COUNTING IN MULTIPLY UNIT ON DIVISION

15.4.1
DURING A DIVISION PROBLEM, THE MULT UNIT REMAINS DISENGAGED FROM TRANSFER RACKS UNTIL THE QUOTIENT STROKE AND THE NUMBER OF SUBTRACTING STROKES ARE COUNTED INTO MULT UNIT GEARS (5) (PLATE 12). ON DIVISION, LIST UNIT IS AUTOMATICALLY POSITIONED LATERALLY TO ALIGN THE DIVISOR TO THE LEFT COLUMN OF THE DIVIDEND AND, THROUGH THE MULT UNIT CONNECTOR (7), MULT COUNTER FINGER (3) IS POSITIONED LATERALLY TO ALIGN WITH PROPER MULT UNIT GEAR (5).

15.4.2
THE MULT UNIT GEAR (5) IS ACTUATED IN SAME MANNER ON DIVISION AS ON MULTIPLICATION, VIZ., MULT COUNTER CONNECTOR (7) IS ENGAGED TO CONNECT PROPER COLUMN OF MULT UNIT TO LIST UNIT, #3 M & D SLIDE (26) IS ACTUATED TO COUNT NUMBER OF SUBTRACT STROKES, OSCILLATING MULT COUNTER SHAFT (20) AND MULT COUNTER FINGER (3), CAUSING FINGER (3) TO ROTATE MULT UNIT GEAR (5) ONE TOOTH. IN THIS MANNER, THE NUMBER OF SUBTRACTING STROKES ARE COUNTED INTO THE MULT UNIT GEARS (5). AS "OVER-SUBTRACTION" OCCURS, (THE MULTIPLY COUNTER FINGER (3) HAVING ALSO ENTERED ONE DIGIT TOO MANY IN THE MULTIPLY UNIT), THE DIVISOR IS ADDED BACK IN ACCUMULATOR UNIT AND THE MULTIPLY COUNTER FINGER RESTORES MULT UNIT GEAR (5) ONE TOOTH. THIS IS ACCOMPLISHED BY THE FORWARD MOVEMENT OF #1 M & D SLIDE (24) WHICH CAUSES MULT COUNTER SHAFT (20) AND MULT COUNTER FINGER (3) TO AGAIN BE OSCILLATED, THIS TIME ROTATING MULT GEAR (5) IN OPPOSITE DIRECTION ONE TOOTH.

15.4.3
AS DIVISION PROBLEM PROGRESSES AND LIST UNIT IS BACKSPACED ONE COLUMN TO RIGHT, THE MULT COUNTER CONNECTOR (7) WILL LOCATE MULT COUNTER FINGER (3) WITH MULT UNIT GEAR (5) TO RIGHT, WHERE COUNTING IN PROCESS WILL AGAIN BE REPEATED. THIS PROCESS WILL CONTINUE UNTIL END OF PROBLEM IS SENSED, AT WHICH TIME, QUOTIENT WILL BE DRIVEN OUT OF MULT UNIT GEARS (5) IN SAME MANNER AS DESCRIBED IN 15.3.1 THROUGH 15.3.5.

XVI. MULTIPLICATION

16.1
IN MULTIPLICATION, THE MULTIPLIER IS STORED IN MULTIPLY UNIT AND MULTIPLICAND IS HELD IN LIST UNIT. AS MULTIPLIER IS COUNTED OUT OF MULT UNIT, TRANSFER RACKS ACCUMULATE THE VALUE IN LIST UNIT INTO ACCUMULATOR SECTION AS THE PRODUCT.

16.2 ENTERING MULTIPLIER

16.2.1
MULTIPLIER IS TRANSFERRED FROM LIST UNIT TO MULT UNIT AND RECALL UNIT WHEN MULT KEY (PLATE 13) IS DEPRESSED.

16.2.2
MULT U. CAM SHIFT SLIDE (27) IS PUSHED TO FRONT, CAMMING U. CAM SHAFT SHIFT GEAR (28) TO RIGHT. THIS POSITIONS U. CAM SHAFT TO RIGHT TO ALIGN CAMS WITH THEIR RESPECTIVE SLIDES.

16.2.3
M & D CONTROL SLIDE (25) IS PUSHED TO REAR, CARRYING DECIMAL KEY SLIDE (26) TO REAR THROUGH STUD "A". AT THIS TIME, M & Q CONTROL SLIDE FINGER (36) ON DECIMAL KEY SLIDE, PASSES UNDER M & Q BRIDGE (38). M & D CONTROL SLIDE (25) ALSO CARRIES U. CAM SHAFT FEED LATCH LOCATOR LINK (12) REARWARD WHICH CONTACTS AND ROTATES U. CAM SEGMENT DRIVE HOOK (15) OVER U. CAM SHAFT AUXILIARY FEED LATCH LINK (13).

16.2.4
M & D MOTOR TRIP SLIDE (45) (FIGURE 1) MOVES FORWARD WITH FRONT EXTENSION ENTERING BALL HOUSING SUPPORT BRACKET TO INTERLOCK DIGIT KEYS AND FEATURE KEYS. MOTOR TRIP SLIDE (45) ALSO ROTATES MOTOR TRIP SHAFT (46) CAUSING MOTOR TO OPERATE. FEATURE KEY LOCK BAR (44) WILL TRAP SLIDES IN ACTUATED POSITION FOR DURATION OF MAINSHAFT CYCLE, THROUGH MOTOR TRIP SLIDE (45).

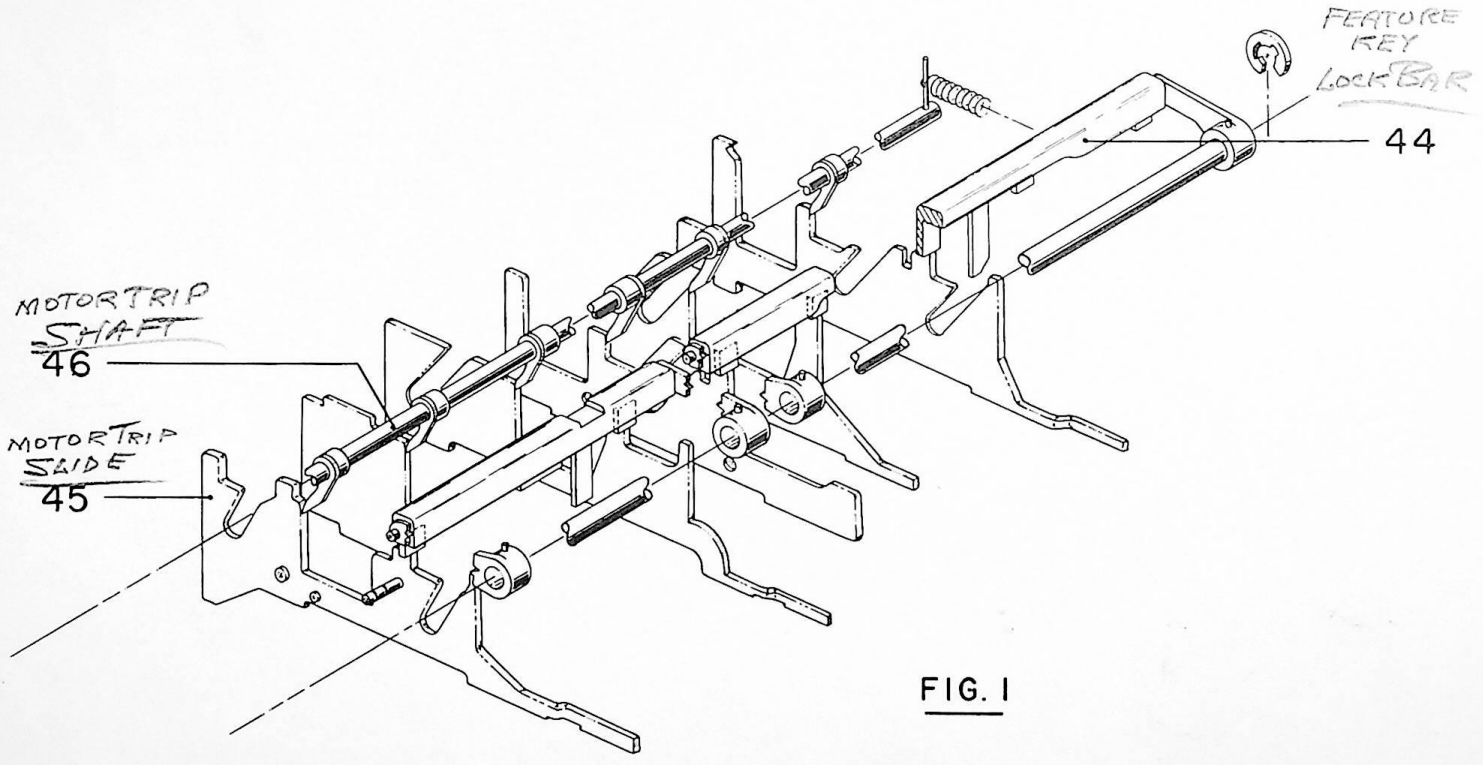


FIG. 1

16.2.5

AS MAINSHAFT STARTS TO ROTATE, CAM ROLLER (C) (PLATE 13) WILL CONTACT AND PIVOT U. CAM SHAFT AUXILIARY FEED LATCH LINK (13), CAUSING IT TO CONTACT U. CAM SEGMENT DRIVE HOOK (15) MOVING IT AND U. CAM SHAFT SEGMENT DRIVE LINK (21) REARWARD. U. CAM SHAFT FEED SEGMENT (22) WILL ROTATE AND, THROUGH DRIVE RATCHET GEAR (23) AND U. CAM SHAFT SHIFT GEAR (28) ROTATE U. CAM SHAFT TO "A" POSITION. U. CAM SHAFT IS NOW LOCKED TO RIGHT BY U. CAM TO LOCK SHAFT IN CENTER POSITION (29). AS FEED LATCH LINK (13) PIVOTS AND U. CAM SEGMENT DRIVE HOOK (15) MOVES REARWARD, LIP "D" WILL MOVE DOWN UNDER ARM "B" OF U. CAM SHAFT FEED LATCH LOCATOR LINK (12). AS MAINSHAFT CONTINUES TO ROTATE, CAM ROLLER (C) WILL PASS UNDER FEED LATCH LINK (13) AND ALLOW U. CAM SHAFT FEED SEGMENT (22) TO RESTORE, ALLOWING RATCHET GEAR (23) TO RATCHET TO NORMAL.

16.2.6 WHEN U. CAM SHAFT IS AT "A" POSITION (PLATE 18)

(1) U. CAM IS HOLDING M & Q BRIDGE CONTROL SLIDE (31) (PLATE 13) PARTIALLY TO REAR. REAR PORTION OF M & Q BRIDGE CONTROL SLIDE (31) WILL PIVOT M & Q FINGER LOCATOR (35) AWAY FROM M & Q CONTROL SLIDE FINGER (36).

(2) U. CAM (29) IS LOCKED BY EAR ON KEYBOARD SUPPORT PLATE TO LOCK U. SHAFT TO RIGHT.

(3) RIGHT SIDE OF U. CAM (28) IS TO RIGHT OF MULT U. CAM SHIFT SLIDE (27) AND LEFT SIDE IS IN POSITION TO BLOCK DIV. U. CAM SHIFT SLIDE (32). THE LATTER IS EFFECTIVE AT "A" POSITION ONLY, WHEN MAINSHAFT IS AT NORMAL.

(4) U. CAM SHAFT DETENT GEAR (20) IS DETENTED AT "A" BY U. CAM SHAFT DETENT YOKE (16).

(5) LEFT SIDE OF U. CAM (17) IS PUSHING CHARACTER FAN FINGER (18) TO ALIGN CHARACTER FAN (19) FOR CHARACTER RACK TO PRINT MULT SYMBOL.

(6) U. CAM (12) (PLATE 13.1) IS PUSHING MULT TOTAL SLIDE (11) TO REAR. THIS ENGAGES MULT ACTUATOR HOOK (13) WITH FORWARD STROKE ACTUATING BAR.

16.2.7

AS MAINSHAFT CONTINUES TO ROTATE, FORWARD STROKE ACTUATING BAR WILL ENGAGE BOTH LIST UNIT AND MULTIPLY UNIT WITH TRANSFER RACKS, TRANSFERRING MULTIPLIER TO MULT UNIT GEARS AND RESTORING LIST UNIT GEARS TO NORMAL. MULTIPLIER IS PRINTED ON TAPE AND, DURING SECOND HALF OF CYCLE, LIST UNIT BECOMES DISENGAGED WITH TRANSFER RACKS AND IS RESTORED TO RIGHT. RECALL UNIT IS ENGAGED TO RETAIN MULTIPLIER.

AS MAINSHAFT RESTORES TO NORMAL, FULL STROKE LIFT LINK (41) (FIGURE 2) WILL RAISE FULL STROKE ARM (9). THIS RESTORES FEATURE KEY LOCK BAR (44) (FIGURE 1) TO NORMAL WHICH ALLOWS THE FOLLOWING SLIDES TO NORMALIZE:

(1) MOTOR TRIP SLIDE (45) WILL MOVE REARWARD, RELEASING MOTOR TRIP SHAFT (46) AND UNLOCKING DIGIT KEYS.

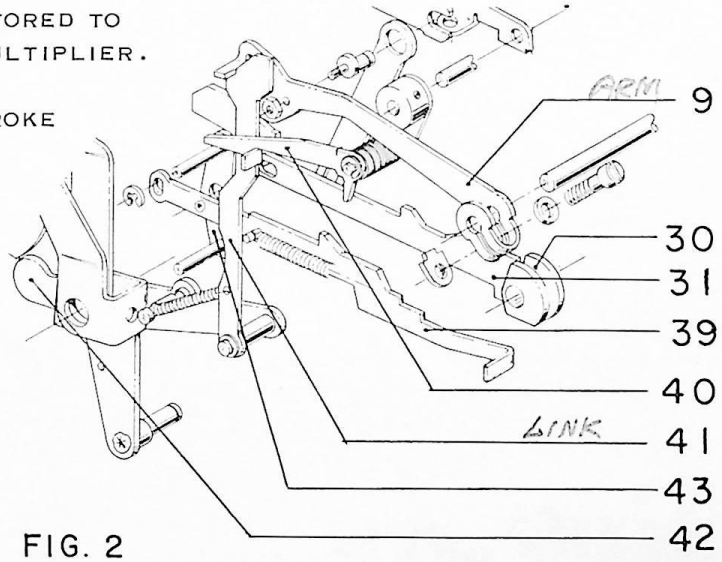


FIG. 2

16.2.7 (CONT'D.)

(2) M & D CONTROL SLIDE (25) (PLATE 13) MOVES FORWARD, CARRYING U. CAM SHAFT FEED LATCH LOCATOR LINK (12) FORWARD. THIS ALLOWS ARM "B" TO RAISE AND BE POSITIONED IN FRONT OF U. CAM SEGMENT DRIVE HOOK (15).

(3) DECIMAL KEY SLIDE (26) MOVES FORWARD AND, AT THIS TIME, M & Q CONTROL SLIDE FINGER (36) WILL MOVE UP INTO POSITION WITH M & Q BRIDGE (38) SINCE M & Q FINGER LOCATOR (35) HAS BEEN ROTATED AWAY FROM SLIDE FINGER (36).

(4) MULT U. CAM SHIFT SLIDE (27) WILL MOVE REARWARD TO NORMAL POSITION.

16.3 ENTERING MULTIPLICAND

16.3.1

AFTER MULTIPLICAND HAS BEEN ENTERED IN LIST UNIT, MULT KEY IS DEPRESSED A SECOND TIME. LIST UNIT REMAINS IN MESH FOR ENTIRE CYCLE. U. CAM SHAFT IS ROTATED TO "B" POSITION. MULTIPLICAND IS PRINTED ON TAPE AND M & Q BRIDGE ASSEMBLY IS POSITIONED REARWARD. RECALL UNIT REMAINS DISENGAGED FOR ENTIRE CYCLE. WHEN MULT KEY IS DEPRESSED SECOND TIME:

16.3.2

MULT U. CAM SHIFT SLIDE (27) IS PUSHED TO FRONT. HOWEVER, IT PERFORMS NO FUNCTION AT THIS TIME.

16.3.3

M & D CONTROL SLIDE (25) IS PUSHED TO REAR, CARRYING DECIMAL KEY SLIDE (26) TO REAR THROUGH STUD "A" AND, SINCE M & Q LOCATOR FINGER (35) HAS BEEN ROTATED AWAY FROM M & Q CONTROL SLIDE FINGER (36), THE LATTER WILL CONTACT LIP ON M & Q BRIDGE (38) MOVING M & Q MECHANISM (37) REARWARD. REARWARD MOVEMENT OF M & Q MECHANISM (37) ROTATES MULT COUNTER CONTROL YOKE (8) AND ECCENTRIC STUD (5). DIVISOR UNIT CONTROL (19) (PLATE 13.1) WILL NOW BE ROTATED, ENGAGING MULT COUNTER CONNECTOR (7) WITH MULT COUNTER CONNECTOR RACK (54) ON LIST UNIT.

REARWARD MOVEMENT OF M & Q MECHANISM (37) MOVES M & D ARM LOCATOR LIMIT (6) TO REAR. ON THIS AND FOLLOWING STROKE, VERTICAL POSITIONING OF M & D ARM LOCATOR (57) WILL BE CONTROLLED BY LEFT ARM OF ZERO DROP-IN BAR (1).

REAR OF M & Q MECHANISM (37) ALSO CAUSES M & D DRIVE ARM (51) TO MOVE TO REAR, ALLOWING M & D DRIVE LINK (59) TO REST ON TOP OF M & D MECHANISM DRIVE ARM (50). HOWEVER, M & D ARM DRIVE LINK (59) WILL NOT BE DRIVEN ON THIS STROKE. IT IS ONLY LATCHED ON THIS STROKE.

WHEN M & D CONTROL SLIDE (25) (PLATE 13) MOVES REARWARD, U. CAM SHAFT FEED LATCH LOCATOR LINK (12) WILL AGAIN ROTATE U. CAM SEGMENT DRIVE HOOK (15) OVER U. CAM SHAFT AUXILIARY FEED LATCH LINK (13).

16.3.4

M & D MOTOR TRIP SLIDE (45) (FIGURE 1) MOVES FORWARD, AGAIN BLOCKING DIGIT KEYS, ROTATING MOTOR TRIP SHAFT AND ALLOWING FEATURE KEY LOCK BAR TO BE RELEASED AND LATCH THIS SLIDE IN PLACE UNTIL END OF MULT PROBLEM. AT THIS TIME, BECAUSE LIST UNIT MOVED TO LEFT, RECALL UNIT CONTROL LATCH (68) (PLATE 13.2) WILL MOVE FORWARD AND, AS FEATURE KEY LOCK BAR ALLOWS LATCH RELEASE LINK (75) TO FALL, AUTO RECALL LATCH (76) WILL MOVE TO LATCHING POSITION ON RECALL UNIT CONTROL BRACKET (69). THUS, UNTIL END OF A MULTIPLICATION PROBLEM, FORWARD AND RETURN STROKE RECALL ACTUATOR HOOKS WILL NOT BE CONTROLLED FROM THIS POINT.

16.3.5

AS MAINSHAFT STARTS TO ROTATE, CAM ROLLER (C) (PLATE 13) WILL CONTACT AND PIVOT U. CAM SHAFT AUXILIARY FEED LATCH LINK (13), CAUSING IT TO CONTACT U. CAM SEGMENT DRIVE HOOK (15), MOVING IT AND U. CAM SHAFT SEGMENT DRIVE LINK (21) REARWARD. U. CAM SHAFT FEED SEGMENT (22) WILL ROTATE AND, THROUGH DRIVE RATCHET GEAR (23) AND U. CAM SHAFT SHIFT GEAR (28), ROTATE U. CAM SHAFT TO "B" POSITION. AS CAM ROLLER (C) PASSES UNDER FEED LATCH LINK (13), U. CAM SHAFT FEED SEGMENT WILL RESTORE AND RATCHET GEAR (23) WILL RATCHET TO NORMAL. AT THIS TIME, U. CAM SEGMENT DRIVE HOOK (15) WILL MOVE UNDER FEED LATCH LOCATOR LINK (12) TO BE HELD OUT OF LATCHING POSITION WITH FEED LATCH LINK (13) FOR REMAINDER OF MULTIPLICATION PROBLEM.

16.3.6 WHEN U. CAM SHAFT IS AT "B" POSITION:

(1) U. CAM (30) (FIGURE 3) IS HOLDING M & Q BRIDGE CONTROL SLIDE (31) FULLY TO REAR. AT THIS TIME, M & Q BRIDGE CONTROL SLIDE (31) CARRIES CONTINUOUS RUNNING SLIDE (39) REARWARD, LOCATING CONTINUOUS RUNNING BELLCRANK (43) SO ITS STUD PREVENTS FULL STROKE LIFT LINK (41) FROM LATCHING ON FULL STROKE ARM (9). THIS KEEPS MOTOR RUNNING FOR THE REMAINDER OF PROBLEM.

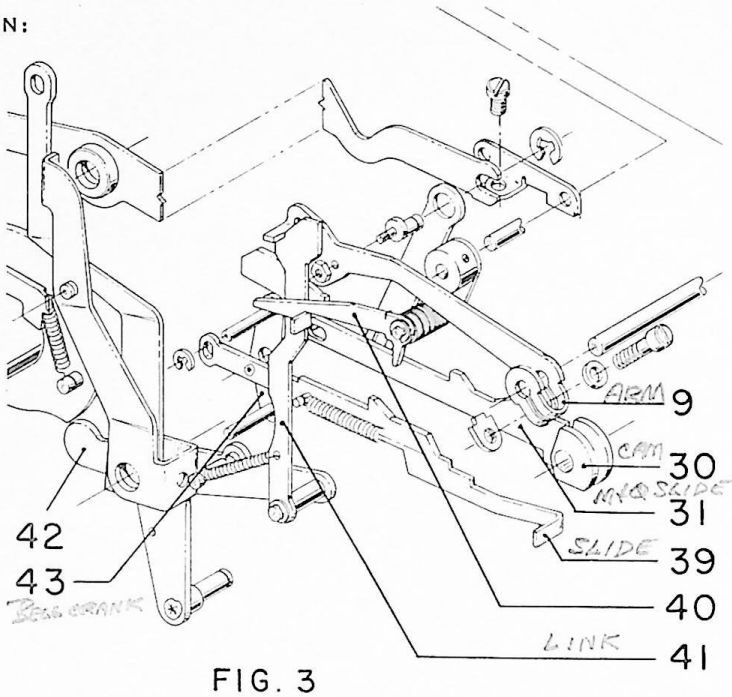


FIG. 3

(2) U. CAM (29) (PLATE 13) IS BLOCKED BY EAR ON KEYBOARD SUPPORT PLATE.

(3) U. CAM (88) (PLATE 13.3) CONTACTS AND ROTATES NON-ADD ACTUATOR YOKE (89) WHICH, THROUGH ITS LATCH (84) ROTATES NON-ADD LATCH LINK (85). THE LATTER WILL, THROUGH LINK (90), ROTATE NON-ADD SHAFT ASSEMBLY (91). THIS REMOVES NON-ADD FLANGE (81) FROM OVER ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (82). THIS ALLOWS LINK "A" ON REAR OF ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (82) TO RAISE, ALLOWING ACCUMULATOR HOOK (92) TO WITHDRAW FROM PATH OF FORWARD STROKE ACTUATING BAR (SEE ITEM 7).

(4) U. CAM SHAFT DETENT GEAR (20) (PLATE 13) IS DETENTED AT "B" BY U. CAM SHAFT DETENT YOKE (16).

(5) LEFT SIDE OF U. CAM (17) IS PUSHING CHARACTER FAN FINGER (18) TO ALIGN CHARACTER FAN FOR CHARACTER RACK TO PRINT MULT SYMBOL.

(6) U. CAM (12) (PLATE 13.1) HAS RELEASED MULT TOTAL SLIDE (11), WITHDRAWING MULT ACTUATOR HOOK (13).

(7) U. CAM (83) (PLATE 13.3) IS PUSHING ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (82) TO REAR. THIS WILL PLACE ACCUMULATOR HOOK (92) IN PATH OF FORWARD STROKE ACTUATING BAR ON FOLLOWING CYCLES. (SEE ITEM 3)

16.3.6 (CONT'D.)

(8) U. CAM (73) (PLATE 13.2) PUSHES LIST UNIT FORWARD STROKE HOOK MULT CONTROL SLIDE (74) TO REAR WHICH CARRIES MULT LIST UNIT RETURN STROKE HOOK AND NON-PRINT RETURN STROKE HOOK CONTROL SLIDE (64) REARWARD AND PLACES BOTH LIST UNIT RETURN HOOK (63) AND NON-PRINT HOOK (102) (PLATE 13.4) IN PATH OF RETURN STROKE ACTUATING BAR.

AT SAME TIME, RECALL ACTUATOR HOOK CONTROL BELLCRANK (70) (PLATE 13.2) WILL BE PIVOTED BY MULT CONTROL SLIDE (74) WITHDRAWING CONTROL FINGER (67) AND RECALL RETURN STROKE ACTUATING HOOK (66) WHICH WILL KEEP RECALL UNIT OUT OF MESH UNTIL BLANK STROKE BEFORE PRODUCT STROKE AND, THROUGH RECALL ACTUATING HOOK CONTROL LINK (71), ROTATES STORAGE CONTROL SHAFT (72) TO PREVENT RECALL UNIT FROM CLEARING ON FIRST HALF OF MAINSHAFT CYCLE: THEREBY RETAINING MULTIPLIER IN RECALL UNIT.

16.3.7

AS MAINSHAFT CONTINUES TO ROTATE, FORWARD STROKE ACTUATING BAR WILL ENGAGE LIST UNIT WITH TRANSFER RACKS AND, THROUGH LIST UNIT GEARS, DRIVE TRANSFER RACKS TO REAR, PRINT MULTIPLICAND AND SYMBOL ON TAPE. DURING SECOND HALF OF MAINSHAFT CYCLE, RETURN STROKE ACTUATING BAR KEEPS LIST UNIT ENGAGED WITH TRANSFER RACKS TO RETAIN MULTIPLICAND IN LIST UNIT GEARS. RETURN STROKE ACTUATING BAR ALSO ACTUATES NON-PRINT ACTUATING HOOK (102) (PLATE 13.4), PIVOTING NON-PRINT BELLCRANK (94), MOVING TYPE FIRING PLATE (93) AND NON-PRINT LINK (126) (FIGURE 4) TO RIGHT, PIVOTING NON-PRINT ACTUATING FINGER (125).

NON-PRINT ACTUATING FINGER (125) SLIDES LIST UNIT RESET BELLCRANK (122) TO LEFT, THROUGH KEY (124) SO ROLL "F" IS NOT ALIGNED WITH LIST UNIT RESTORING MAINSHAFT CAM (123) THEREFORE, WHEN MAINSHAFT ROTATES, LIST UNIT WILL NOT BE RESTORED TO RIGHT.

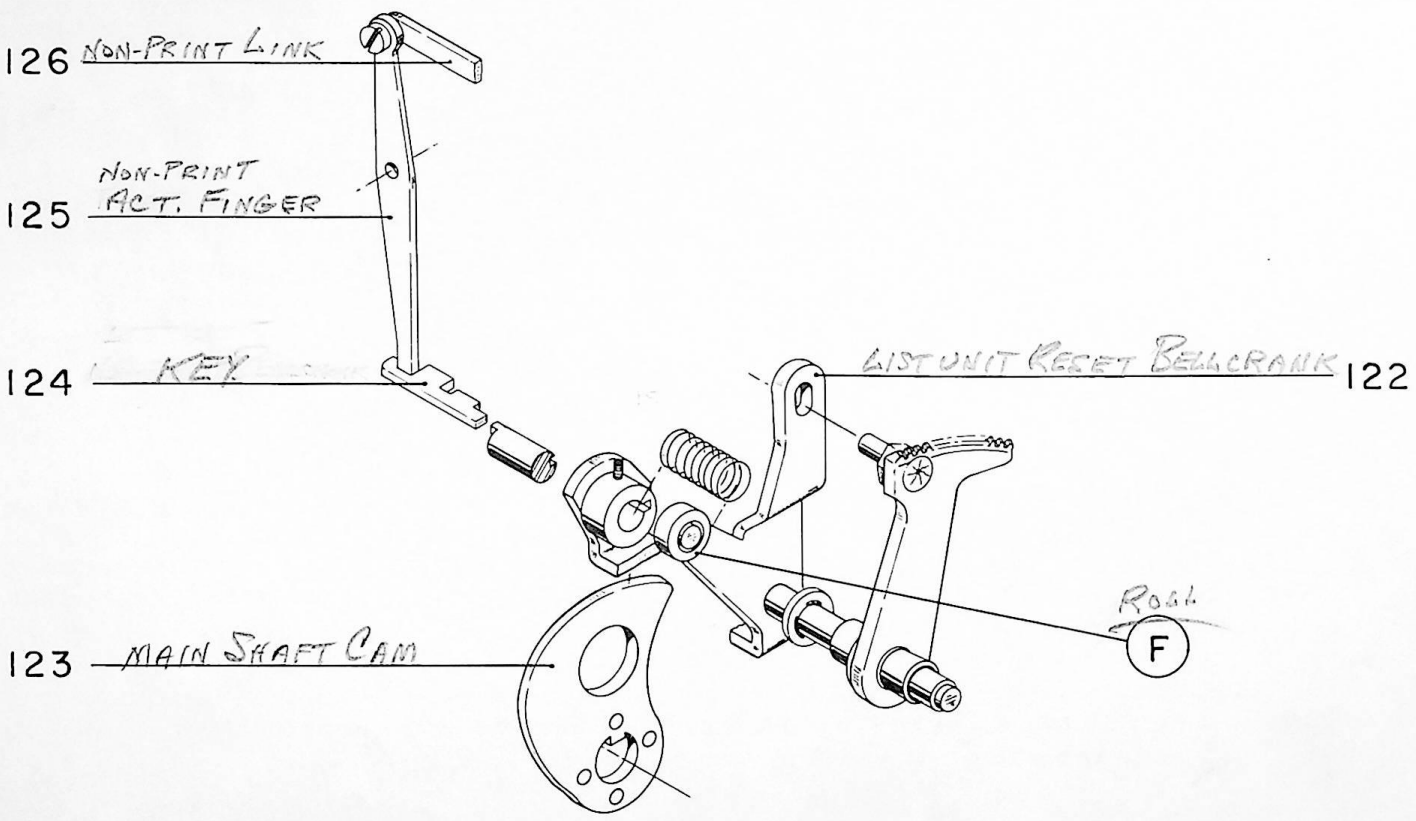


FIG. 4

16.3.7 (CONT'D.)
TYPE FIRING PLATE (93) (PLATE 13.4) ALSO DISENGAGES PLATEN FEED ARM (95) TO PREVENT CARRIAGE FEED. DURING FIRST PORTION OF CYCLE, WHEN LIST UNIT MOVED INTO MESH, NON-PRINT CONTROL LINK (99) PIVOTED, LIFTING FRONT END OUT OF PATH OF EAR ON NON-PRINT BLOCK SLIDE (100) AND, AS NON-PRINT ACTUATOR HOOK (102) IS ROTATED, NON-PRINT BLOCK SLIDE (100) WILL MOVE TO REAR, UNDER LIP ON REAR ARM OF NON-PRINT ACTUATOR HOOK (102). THIS WILL HOLD NON-PRINT MECHANISM IN POSITION TO PREVENT PRINTING ACTION. THIS, IN TURN, WILL PREVENT LIST UNIT FROM BEING RESTORED, PAPER SPACING AND RIBBON FEED. AS NON-PRINT BLOCK SLIDE (100) MOVED REARWARD, HIGH SPEED ACTUATOR BELLCRANK (97) PIVOTED, ROTATING HIGH SPEED CONTROL LEVER (98). THIS WILL PLACE MORE SPRING TENSION ON CONTACT BREAKER ARM, CAUSING MACHINE TO OPERATE AT HIGHER SPEED.

16.3.8
NEAR END OF MAINSHAFT CYCLE, ROLL ON M & D DRIVE ARM (50) (PLATE 13.1) MOVES TO LOW SURFACE OF MAINSHAFT M & D DRIVE CAM (49), LATCHING M & D ARM DRIVE LINK (59) TO DRIVE M & D OPERATING FINGER (56) ON NEXT MAINSHAFT CYCLE.

AT END OF THIS CYCLE, LIST UNIT CONTROL LATCH RELEASE LINK (86) (PLATE 13.3) CAMMED DOWN BY NON-ADD LATCH RELEASE CAM (87), (OPERATED BY RACK RESET SHAFT), LIFTS AND RELEASES NON-ADD LATCH (84). THIS ALLOWS NON-ADD LATCH LINK (85) TO RESTORE, ALLOWING NON-ADD FLANGE (81) TO DEPRESS LINK "A" ON ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (82) WHICH CAMS ACCUMULATOR HOOK IN PATH OF FORWARD STROKE ACTUATING BAR (80) (PLATE 13.2).

16.4 COUNTING CYCLES - MULTIPLICATION

16.4.1
DURING THESE STROKES, LIST UNIT DRIVES TRANSFER RACKS ON FIRST HALF OF MAINSHAFT CYCLE ADDING MULTIPLICAND TO ACCUMULATOR UNIT WHICH IS ENGAGED WITH TRANSFER RACKS ON FIRST HALF OF CYCLE. TRANSFER RACKS RE-ENTER MULTIPLICAND INTO LIST UNIT GEARS ON SECOND HALF OF MAINSHAFT CYCLE. MULTIPLY COUNTING FINGER INDEXES MULT UNIT GEAR ONE TOOTH FOR EACH STROKE, REDUCING AMOUNT IN MULT UNIT GEAR TO ZERO.

16.4.2
AS MAINSHAFT ROTATES ON THIS CYCLE, LOW SURFACE OF M & D LIFT LINK CAM (62) (PLATE 13.1) LOWERS REAR OF M & D LIFT ARM (48) AND, THROUGH LINK (61) LOWERS M & D ARM LOCATOR (57). M & D OPERATING FINGER (56) WILL BE IN LINE WITH LOWER PORTION OF #3 M & D SLIDE (26) DUE TO M & D ARM LOCATOR (57) LOWERING M & D ARM LOCATOR HOOK (55) WHICH DEPRESSED LEFT ARM OF ZERO DROP-IN BAR (1) UNTIL ZERO DROP-IN FINGER (2) LIMITS AGAINST FLANGE OF MULT UNIT GEAR (5).

AT THIS TIME, M & D DRIVE ARM CAM (49) ROTATES M & D DRIVE ARM (50) WHICH, LATCHED TO REAR OF M & D ARM DRIVE LINK (59), DRIVES M & D OPERATING ARM (60) AND M & D OPERATING FINGER (56) FORWARD. THE LATTER PUSHES #3 M & D SLIDE (26) FORWARD, CAUSING MULT COUNTER FINGER TO ROTATE FIRST COLUMN MULT UNIT GEAR IN A DESCENDING MANNER. (SEE MULT UNIT AND COUNTER, SECTION 15).

AS MAINSHAFT WILL CONTINUE TO ROTATE, WITH THE MULTIPLICAND BEING ADDED INTO ACCUMULATOR SECTION ON FIRST HALF OF CYCLE AND THE TRANSFER RACKS RE-ENTERING THE MULTIPLICAND INTO LIST UNIT GEARS ON REMAINDER OF CYCLE.

16.4.4
THE FOREGOING PROCESS WILL BE REPEATED UNTIL MULT UNIT GEAR IN FIRST COLUMN IS REDUCED TO ZERO.

16.5 SPACE-OVER ON MULTIPLICATION

16.5.1
WHEN MULT UNIT GEAR (5) HAS DESCENDED TO ZERO, NOTCH OF MULT UNIT GEAR (5) WILL BE PRESENTED TO ZERO DROP-IN FINGER (2). THIS WILL ALLOW ZERO DROP-IN FINGER (2) TO ROTATE INTO NOTCH UNTIL FINGERS ON ZERO DROP-IN BAR (1) LIMIT ON FLANGES OF MULT UNIT GEARS THAT ARE OUT OF ZERO POSITION. THUS, M & D ARM LOCATOR (57) WILL NOW TRAVEL DOWNWARD UNTIL M & D OPERATING FINGER (56) IS IN LINE WITH #4 M & D SLIDE (121) (PLATE 13.5).

16.5.2
M & D OPERATING FINGER (56) (PLATE 13.5) WILL NOW DRIVE #4 M & D SLIDE (121) FORWARD AND, THROUGH MULT LIST UNIT CONTROL SHAFT ACTUATING LINK (119), MULT LIST UNIT SHAFT ACTUATING BELLCRANK (118) AND ARM (114), PLACE MULT UNIT CONTROL SHAFT (111) IN LATCHED POSITION. AT THIS TIME, MULT LIST UNIT FORWARD STROKE CONTROL SLIDE ACTUATOR FINGER (112) CONTACTS MULT LIST UNIT CONTROL SLIDE YOKE (77) AND MOVES LIST UNIT FORWARD STROKE SLIDE (78) FORWARD. THIS WITHDRAWS LIST UNIT FORWARD STROKE ACTUATING HOOK (79) FROM PATH OF FORWARD STROKE ACTUATING BAR (80). ALSO, AT THIS TIME, MULT LIST UNIT RETURN STROKE CONTROL ARM (110) MOVES FORWARD. PIVOTING MULT LIST UNIT RETURN STROKE CONTROL LINK (109) AND MULT LIST UNIT CONTROL SLIDE FINGER (108), ALLOWING LIST UNIT RETURN STROKE ACTUATING HOOK TO WITHDRAW FROM PATH OF RETURN STROKE ACTUATING BAR (101).

THE #4 M & D SLIDE (121) ALSO PIVOTS LIST UNIT FORWARD SPACING BAIL (103). LIST UNIT FORWARD SPACING BAIL (103) FORCES CORRECTION KEY SLIDE (104) TO REAR, CAUSING LIST UNIT TO ESCAPE TO NEXT COLUMN. (SEE CORRECTION, SECTION 7.)

16.5.3
NEAR END OF MAINSHAFT CYCLE, NON-ADD CAM (87) ACTUATED BY RACK RESET SHAFT, ROTATES LIST UNIT CONTROL LATCH RELEASE LINK (86) WHICH RELEASES LATCH (115) FROM FRONT PLATE, ALLOWING MULTIPLY LIST UNIT CONTROL SHAFT (111) TO RESTORE AGAIN ALLOWING BOTH FORWARD AND RETURN LIST UNIT ACTUATOR HOOKS TO BE PRESENTED IN PATH OF THEIR RESPECTIVE ACTUATING BARS.

16.6 SENSING END OF PROBLEM

16.6.1
WHEN ALL MULTIPLY UNIT GEARS (5) (PLATE 13.1) HAVE BEEN RETURNED TO ZERO BY THE COUNTING ACTION, FINGERS ON ZERO DROP-IN BAR (1) ENTER NOTCHES IN ALL GEAR FLANGES, PERMITTING M & D ARM LOCATOR (57) TO TRAVEL DOWNWARD AND ALIGN M & D OPERATING FINGER (56) WITH #5 M & D SLIDE (2).

16.7 BLANK STROKE BEFORE PRODUCT

16.7.1
WHEN M & D ARM LOCATOR (57) TRAVELS DOWNWARD AND ALIGNS M & D OPERATING FINGER (56) WITH #5 M & D SLIDE, FORWARD MOVEMENT OF M & D OPERATING FINGER (56) WILL PUSH #5 M & D SLIDE (2) FORWARD. THIS ROTATES M & Q RELEASE CAM SHAFT (3) (PLATE 13) WITH U. CAM SHAFT AUXILIARY FEED CONTROL (1) MOVING INTO A LATCHING POSITION WITH CONTROL LATCH (10) AND, AT THIS TIME, STUD ON AUXILIARY FEED CONTROL (1) LOWERS U. CAM AUXILIARY FEED LATCH (24) OVER FLAT STUD ON U. CAM SEGMENT DRIVE LINK (14) AND, BECAUSE AUXILIARY FEED LATCH LINK (13) DRIVES ON EACH MAINSHAFT CYCLE, U. CAM SHAFT FEED SEGMENT (22) WILL ROTATE U. CAM SHAFT TO "C" POSITION. U. CAM AUXILIARY FEED LATCH (24) WILL NOW REMAIN ENGAGED WITH FLAT STUD ON U. CAM SEGMENT DRIVE LINK (14) EFFECTING A ROTATION OF U. CAM SHAFT ONE POSITION ON EACH OF THE TWO FOLLOWING STROKES.

16.7.1 (CONT'D.)
SIMULTANEOUSLY, M & Q RELEASE ARM (4), PINNED ON M & Q RELEASE CAM SHAFT (3), CONTACTS AND RELEASES M & Q BRIDGE (38) FROM M & Q CONTROL SLIDE FINGER (36). THIS ALLOWS M & Q BRIDGE MECHANISM TO RESTORE TO FRONT OF MACHINE, RESTORING MULT COUNTER CONNECTOR (7) (PLATE 13.1) OUT OF MULT COUNTER CONNECTOR RACK (54). REAR OF M & Q BRIDGE MECHANISM ROTATES M & D DRIVE ARM (51) FORWARD. THIS WILL RELEASE M & D ARM DRIVE LINK (59) FROM M & D MECHANISM DRIVE ARM (50) AT END OF THIS STROKE, PREVENTING ANY FURTHER DRIVING ACTION BY M & D OPERATING FINGER (56) ON FOLLOWING STROKES.

FURTHER, WHEN #5 M & D SLIDE (2) IS PUSHED TO FRONT, EXTENSION "A" ON #5 M & D SLIDE (2) WILL URGE M & D ARM LOCATOR HOOK (55) FROM FLANGE ON LEFT ARM OF ZERO DROP-IN BAR (1). THIS PERMITS ZERO DROP-IN BAR (1) TO RESTORE, WITHDRAWING FINGERS FROM NOTCHES IN FLANGES OF MULT UNIT GEARS.

16.7.2 WHEN U. CAM SHAFT IS AT "C" POSITION:

(1) U. CAM (30) (PLATE 13) IS HOLDING M & Q BRIDGE CONTROL SLIDE (31) FULLY TO REAR, CARRYING CONTINUOUS RUNNING SLIDE (39) (FIGURE 3) REARWARD TO KEEP MOTOR RUNNING.

(2) U. CAM (29) (PLATE 13) IS LOCKED BY EAR ON KEYBOARD SUPPORT PLATE TO LOCK U. CAM SHAFT TO RIGHT.

(3) RIGHT SIDE OF U. CAM (28) IS TO RIGHT OF MULT U. CAM SHIFT SLIDE (27).

(4) LEFT SIDE OF U. CAM (27) (FIGURE 5) IS HOLDING MULT DRIVE RACK CONNECTOR BELLCRANK (30) FORWARD, ALLOWING MULT RACK ACTUATING FINGER (29) TO CONNECT MULT DRIVE RACK (28).

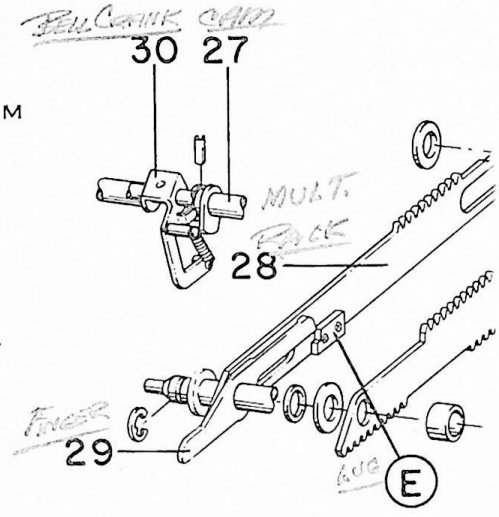


FIG. 5

(5) U. CAM (20) (PLATE 13) IS DETENTED AT "C" BY U. CAM SHAFT DETENT YOKE (16).

(6) LOW SURFACE OF U. CAM (17) ALLOWS CHARACTER FAN FINGER (18) TO FALL TO REAR, LOWERING CHARACTER FAN. THUS, ALL STOPS FOR CHARACTER RACK ARE REMOVED AND CHARACTER RACK WILL THEN TRAVEL REARWARD UNTIL IT LIMITS ON STUD IN CENTER FRAME, ROTATING PRINTING WHEEL TO PRINT A REMAINDER (0) SYMBOL IN RED.

(7) U. CAM (12) (PLATE 13.1) IS PUSHING MULT SLIDE (11) TO REAR. THIS WILL URGE MULT UNIT ACTUATOR HOOK (13) REARWARD WHERE IT WILL INTERCEPT FORWARD STROKE ACTUATING BAR AND ENGAGE MULT UNIT WITH TRANSFER RACKS ON FIRST HALF OF STROKE.

(8) U. CAM (83) (PLATE 13.3) HAS RELEASED ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (82) EFFECTING THE WITHDRAWAL OF ACCUMULATOR ACTUATOR HOOK (92).

(9) LEFT CAM ON U. CAM (73) (PLATE 13.2) CAMS MULT LIST UNIT CONTROL SLIDE YOKE (77) WHICH MOVES LIST UNIT FORWARD STROKE SLIDE (78) FORWARD, WITHDRAWING LIST UNIT FORWARD STROKE ACTUATING HOOK (79) FROM PATH OF FORWARD STROKE ACTUATING BAR (80). AT THIS TIME, RIGHT CAM OF U. CAM (73) HAS RELEASED LIST UNIT FORWARD STROKE HOOK

(9) (CONT'D.)
MULT CONTROL SLIDE (74) WHICH, IN TURN, ALLOWS MULT LIST UNIT RETURN STROKE HOOK AND NON-PRINT RETURN STROKE HOOK CONTROL SLIDE (64) TO RESTORE TO FRONT. THIS WITHDRAWS LIST UNIT RETURN STROKE ACTUATOR HOOK AND NON-PRINT ACTUATOR HOOK (102) (PLATE 13.4) FROM PATH OF RETURN STROKE ACTUATING BAR AND, AT SAME TIME, NON-PRINT CONTROL LINK (100) WILL RESTORE FORWARD, RELEASING REAR ARM OF NON-PRINT ACTUATOR HOOK (102). THE LATTER WI LL PERMIT NON-PRINT BELLCRANK (94), TYPE FIRING PLATE, LIST UNIT RESET BELLCRANK (122) (FIGURE 4) TO RESTORE AND AGAIN ALLOW PLATEN FEED ARM (95) TO ENGAGE CARRIAGE FEED BELLCRANK. NON-PRINT BLOCK SLIDE (100), AS IT MOVES FORWARD, ALSO REDUCES MACHINE SPEED THROUGH ITS ASSOCIATED PARTS.

FURTHER, LIST UNIT FORWARD STROKE HOOK MULT CONTROL SLIDE (74) (PLATE 13.2) RELEASES RECALL ACTUATOR HOOK CONTROL BELLCRANK (70) ALLOWING STORAGE CONTROL SHAFT (72) TO RESTORE. RECALL UNIT GEARS WILL NOW BE RESTORED TO NORMAL WHEN RECALL UNIT LOCK PLATE RELEASE RACK MOVES REARWARD.

16.7.3
CONTINUED ROTATION OF MAINSHAFT WILL NOW DRIVE MULT UNIT DRIVE RACK REARWARD. HOWEVER, SINCE ALL MULT UNIT GEARS ARE AT ZERO, TRANSFER RACKS WILL NOT MOVE REARWARD; THEREFORE, ONLY THE SYMBOL (0) IS PRINTED, BEING PRINTED IN RED. (SEE MULTIPLY UNIT AND COUNTER SECTION.)

THIS OPERATION IS REQUIRED IN EVENT THE STOP KEY IS USED TO TERMINATE A MULTIPLICATION PROBLEM. IN THIS CASE, REMAINDER OF MULTIPLIER WOULD BE DRIVEN OUT OF MULT UNIT GEARS. (SEE STOP KEY - MULTIPLICATION.)

ON SECOND HALF OF MAINSHAFT CYCLE, LIST UNIT WILL BE RESTORED TO RIGHT, WITH EAR ON MULT COUNTER CONNECTOR RACK (54) (PLATE 13.1) ON LIST UNIT CONTACTING MULT COUNTER CONNECTOR (7) AND CARRYING MULT COUNTER FINGER (2) TO NORMAL.

16.8 PRODUCT STROKE

16.8.1
AT BEGINNING OF THIS CYCLE, U. CAM SHAFT AUXILIARY FEED LATCH LINK (13) (PLATE 13) IS ROTATED, DRIVING U. CAM SHAFT FEED SEGMENT (22), ROTATING U. CAM SHAFT TO "D" POSITION.

16.8.2 WHEN U. CAM SHAFT IS AT "D" POSITION:

(1) U. CAM (30) IS HOLDING M & Q BRIDGE CONTROL SLIDE (31) FULLY TO REAR, CARRYING CONTINUOUS RUNNING SLIDE (39) (FIGURE 3) REARWARD TO KEEP MOTOR RUNNING.

(2) U. CAM (29) (PLATE 13) IS LOCKED BY EAR ON KEYBOARD SUPPORT PLATE TO LOCK U. CAM SHAFT TO RIGHT.

(3) RIGHT SIDE OF U. CAM (28) IS TO RIGHT OF MULT U. CAM SHIFT SLIDE (27).

(4) U. CAM (27) (FIGURE 5) HAS RELEASED BELLCRANK (30) DISENGAGING MULT RACK ACTUATING FINGER (29) FROM MULT DRIVE RACK (28).

(5) U. CAM (20) (PLATE 13) IS DETENTED AT "D" BY U. CAM SHAFT DETENT YOKE (16).

16.8.2 (CONT'D.)

(6) U. CAM (17) PUSHES CHARACTER FAN FINGER (18) ALIGNING CHARACTER FAN TO STOP CHARACTER RACK AT MULT TOTAL "T" PRINTING POSITION.

(7) U. CAM (12) (PLATE 13.1) HAS RELEASED MULT TOTAL SLIDE (11) WHICH CAUSES MULT UNIT ACTUATOR HOOK (13) TO WITHDRAW FROM PATH OF FORWARD STROKE ACTUATING BAR.

(8) U. CAM (83) (PLATE 13.3) PUSHED ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (82) REARWARD. THIS PLACES ACCUMULATOR SECTION ACTUATOR HOOK (92) IN PATH OF FORWARD STROKE ACTUATING BAR.

(9) U. CAM (19) (PLATE 6) IS HOLDING TOTAL SUB-TOTAL SLIDE (64) (PLATE 8.3) REARWARD AND, THROUGH LATCH (66) DRIVES TOTAL STROKE SUBTRACT CONTROL SLIDE (63), PLACING SUBTRACT ACTUATOR HOOK ASSEMBLY IN MESH WITH FORWARD STROKE ACTUATING BAR.

TOTAL SUB-TOTAL SLIDE (64) ALSO FULCRUMS TOTAL DRIVE RACK CONTROL LINK (67), ROTATING TOTAL DRIVE RACK CONTROL YOKE (70) AWAY FROM TOTAL RACK ACTUATING FINGER (71) WHICH NOW ENGAGES TOTAL DRIVE RACK.

(10) U. CAM (73) (PLATE 13.2) RELEASES CONTROL SLIDE YOKE (77) WHICH, THROUGH ITS SLIDE, PLACES LIST UNIT FORWARD STROKE ACTUATOR HOOK TO REAR WHERE IT WILL BE ACTUATED TO CAUSE LIST UNIT DRIVE GEAR TO MESH WITH ITS RESPECTIVE RACK. ON THIS STROKE, AS LIST UNIT, RECALL UNIT AND TRANSFER CAM SHAFT DRIVE RACK MOVE REARWARD, LIST UNIT GEARS WILL BE ROTATED TO ZERO POSITION, OVERCOMING DETENT ACTION OF FLEXIBLE PLATE.

16.8.3

AS MAINSHAFT CONTINUES TO ROTATE, SUBTRACT WHEELS WILL ENGAGE WITH INTERMEDIATE GEARS AS ACCUMULATOR SECTION ENGAGES WITH TRANSFER RACKS AND NOW, AS TOTAL DRIVE RACK MOVES REARWARD, THE PRODUCT IS DRIVEN OUT OF ACCUMULATOR SECTION AND PRINTED IN RED. CHARACTER RACK CAUSES MULTIPLY TOTAL "T" SYMBOL TO BE PRINTED. DURING THIS TIME, LIST UNIT GEARS AND RECALL UNIT GEARS ARE RESTORED TO ZERO.

ON SECOND HALF CYCLE, ACCUMULATOR SECTION AND LIST UNIT ARE DISENGAGED AND RECALL UNIT ENGAGES WITH TRANSFER RACKS, STORING PRODUCT IN RECALL UNIT GEARS.

16.9 BLANK STROKE AFTER PRODUCT

16.9.1

AGAIN U. CAM SHAFT IS ROTATED, THIS TIME TO "E" POSITION.

16.9.2

WHILE U. CAM SHAFT ROTATES TO "E" POSITION, U. CAM (43) (PLATE 7.2) CAMS MULT RECALL CONTROL UPPER SECTION (42), ROTATING RECALL UNIT CONTROL SHAFT (41) WHICH, THROUGH MULT RECALL LOCK ACTUATOR FINGER (38) ROTATES STORAGE CONTROL SHAFT (26). THIS ACCOMPLISHES TWO THINGS - PREVENTS RECALL UNIT GEARS FROM BEING CLEARED ON FIRST PORTION OF CYCLE AND WITHDRAWS RECALL UNIT RETURN STROKE ACTUATOR HOOK CONTROL FINGER (20) SO RECALL UNIT WILL NOT BE ENGAGED ON SECOND HALF OF CYCLE.

16.9.3 AT "E" POSITION OF U. CAM SHAFT:

(1) U. CAM (30) (PLATE 13) RELEASES M & Q BRIDGE CONTROL SLIDE (31) AND CONTINUOUS RUNNING SLIDE (39) (FIGURE 3) BOTH SLIDES WILL MOVE FORWARD WITH THE LATTER ROTATING CONTINUOUS RUNNING BELLCRANK (42) WHICH WILL ALLOW FULL-STROKE ARM LIFT ARM (41) TO MOVE TO REAR AND, ON THIS STROKE, WILL THEN RESET FEATURE KEY LOCK BAR, TERMINATING MULT OPERATION.

(2) U. CAM (29) (PLATE 13) IS NOW ROTATED SO NOTCH IN CAM IS ALIGNED WITH EAR ON KEYBOARD SUPPORT PLATE. THUS, U. CAM SHAFT IS NOW IN POSITION TO MOVE TO LEFT; HOWEVER, IT IS STILL HELD TO RIGHT BY MULT U. CAM SHIFT SLIDE (27).

(3) U. CAM (28) IS HELD TO RIGHT AND, IN TURN, HOLDS U. CAM SHAFT TO RIGHT BY MULT U. CAM SHIFT SLIDE (27).

(4) U. CAM (20) IS DETENTED AT "E" POSITION.

(5) U. CAM (17) ALLOWS CHARACTER FAN FINGER (18) TO MOVE TO LOW SURFACE OF CAM, LOWERING CHARACTER FAN. THUS, ALL STOPS FOR CHARACTER RACK ARE REMOVED AND CHARACTER RACK WILL THEN TRAVEL REARWARD UNTIL IT LIMITS ON STUD IN CENTER FRAME, ROTATING PRINTING WHEEL TO PRINT BLANK STROKE AFTER PRODUCT SYMBOL "0" IN BLACK.

(6) U. CAM (83) (PLATE 13.3) HAS RELEASED ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (82) WHICH, BY MOVING FORWARD, WITHDRAWS ACCUMULATOR HOOK (92).

(7) U. CAM (19) (PLATE 6) HAS RELEASED TOTAL SUB-TOTAL SLIDE (64) (PLATE 8.3). TOTAL STROKE SUBTRACT CONTROL SLIDE (63) IS PREVENTED FROM RESTORING ON THIS CYCLE BY SUBTRACT CONTROL BELLCRANK (35).

16.9.4

AS MAINSHAFT CONTINUES TO ROTATE, CHARACTER RACK WILL MOVE REARWARD, CAUSING A "0" TO BE PRINTED ON TAPE AND, ON THIS STROKE, FULL STROKE LIFT LINK (41) (FIGURE 3) WILL RAISE FULL STROKE ARM (9), RESTORING FEATURE KEY LOCK BAR WHICH TERMINATES MULTIPLICATION OPERATION. AT THIS TIME, FOLLOWING SLIDES RESTORE TO NORMAL:

(1) MULT U. CAM SHIFT SLIDE (27) (PLATE 13) MOVES TO REAR, RELEASING U. CAM (28) WHICH, IN TURN, ALLOWS U. CAM SHAFT TO MOVE LEFT (NORMAL POSITION), RELEASING INTERLOCKS FOR ADD, SUBTRACT, SUB-TOTAL TOTAL AND MULT AND DIVISION SUB-TOTAL KEYS.

(2) M & D CONTROL SLIDE (25) MOVES FORWARD.

(3) DECIMAL KEY SLIDE (26) RESTORES TO FRONT.

(4) M & D MOTOR TRIP SLIDE (45) (FIGURE 1) MOVES REARWARD AND, IN SO DOING, REMOVES INTERLOCK FOR DIGIT KEYS.

AS FEATURE KEY LOCK BAR RESTORES, AUTO RECALL LATCH RELEASE LINK (75) (PLATE 13.2) WILL UNLATCH AUTO RECALL LATCH (76) AND ALLOW RECALL UNIT CONTROL LATCH (68) TO PLACE BOTH RECALL ACTUATOR HOOKS IN PATH OF THEIR RESPECTIVE ACTUATING BARS.

16.9.5
AS MAINSHAFT ROTATED TO NORMAL, RACK RESET ARMS UNLATCHED RECALL UNIT CONTROL SHAFT WHICH RELEASES STORAGE CONTROL SHAFT. THIS RESTORES RECALL UNIT MECHANISM TO NORMAL AND ALLOWS RECALL UNIT STROKE HOOK CONTROL FINGER (67) TO MOVE REARWARD.

16.9.6
AT THE TIME FEATURE KEY LOCK BAR RESTORES, FULL STROKE ARM (9) (PLATE 13) WILL RAISE LINK (11), ROTATING CONTROL LATCH (10) WHICH UNLATCHES U. CAM SHAFT AUXILIARY FEED CONTROL (1). THIS ALLOWS STUD ON U. CAM SHAFT AUXILIARY FEED CONTROL (1) TO UNLATCH FEED LATCH (24) FROM FLAT STUD IN U. CAM SEGMENT DRIVE LINK (14), PREVENTING ROTATION OF U. CAM SHAFT ON NEXT OPERATIONS.

XVII DIVISION

17.1
IN DIVISION, THE DIVIDEND IS STORED IN THE ACCUMULATOR. THE DIVISOR, STORED IN LIST UNIT, IS SUBTRACTED FROM THE DIVIDEND. THE NUMBER OF TIMES THE DIVISOR IS SUBTRACTED IS RECORDED IN THE MULTIPLY UNIT AS THE QUOTIENT.

17.2 ENTERING DIVIDEND

17.2.1
THE DIVIDEND IS TRANSFERRED FROM LIST UNIT TO ACCUMULATOR UNIT AND RECALL UNIT AND PRINTED WHEN DIVISION KEY IS DEPRESSED.

17.2.2
DIVISION U. CAM SHAFT SHIFT SLIDE (32) (PLATE 14) MOVES FORWARD, CAMMING U. CAM SHAFT TO LEFT THROUGH U. CAM SHAFT SHIFT GEAR (28). DIVISION U. CAM SHAFT SHIFT SLIDE (32) ALSO PULLS DIVISOR ACTUATOR LINK (17) AND DIV. LOCATOR SHAFT ACTUATOR LINK (7) FORWARD. THE FRONT PORTION OF DIV. LOCATOR SHAFT ACTUATING LINK (7) WILL CONTACT AND ROTATE DIV. LOCATING SHAFT ARM (9) WHICH ROTATES SHAFT (10) AND PLACES DIV. LOCATOR ARM (11) IN MESH WITH TEETH OF DIV. LOCATOR RACK (12). DIVISOR LOCATOR ARM (11), HAVING BEEN CARRIED TO LEFT THE SAME NUMBER OF SPACES AS THERE ARE DIGITS IN DIVIDEND, WILL NOW REMAIN TO LEFT, LOCATING COLUMN OF THE LEFT SIGNIFICANT FIGURE IN DIVIDEND. AT THIS TIME, DIV. LOCATOR SHAFT CONTROL LATCH (8) WILL LATCH ON TOP PLATE, HOLDING DIV. LOCATOR ARM (11) ROTATED.

17.2.3
M & D CONTROL SLIDE (25) (PLATE 13) IS CAMMED REARWARD AND, IN SO DOING, CARRIES DECIMAL KEY SLIDE (26) TO REAR. ON THIS OPERATION, M & Q CONTROL SLIDE FINGER (36) WILL PASS UNDER M & Q BRIDGE (38). M & D CONTROL SLIDE (25) ALSO CARRIES U. CAM SHAFT FEED LATCH LOCATOR LINK (12) REARWARD WHICH CONTACTS AND ROTATES U. CAM SEGMENT DRIVE HOOK (15) OVER U. CAM SHAFT AUXILIARY FEED LATCH LINK (13).

17.2.4
DIV. ESCAPEMENT RELEASE SLIDE (18) (PLATE 14) MOVES REARWARD; HOWEVER, ON THIS OPERATION OF ENTERING THE DIVIDEND, IT PERFORMS NO OPERATION.

17.2.5
MULTIPLY MOTOR TRIP SLIDE (19) (PLATE 4) MOVES FORWARD, WITH FRONT EXTENSION ENTERING BALL HOUSING SUPPORT BRACKET TO INTERLOCK DIGIT KEYS. MOTOR TRIP SLIDE (19) ALSO ROTATES MOTOR TRIP SHAFT (20), CAUSING MOTOR TO OPERATE. FEATURE KEY LOCK BAR WILL TRAP MOTOR TRIP SLIDE (19) WHICH TRAPS ACTUATED SLIDES IN POSITION FOR DURATION OF MAINSHAFT CYCLE.

17.2.6
AS MAINSHAFT STARTS TO ROTATE, CAM ROLLER "C" (PLATE 13) WILL CONTACT AND PIVOT U. CAM SHAFT AUXILIARY FEED LATCH LINK (13), CAUSING IT TO CONTACT U. CAM SEGMENT DRIVE HOOK (15), MOVING IT AND U. CAM SHAFT SEGMENT DRIVE LINK (21) REARWARD. U. CAM SHAFT FEED SEGMENT (22) WILL ROTATE AND, THROUGH DRIVE RATCHET GEAR (23) AND U. CAM SHAFT SHIFT GEAR (28), ROTATE U. CAM SHAFT TO "A" POSITION. U. CAM SHAFT IS NOW LOCKED TO LEFT BY U. CAM TO LOCK SHAFT IN CENTER POSITION (29) AND LEFT KEYBOARD SUPPORT PLATE. AS FEED LATCH LINK (13) PIVOTS AND U. CAM SEGMENT DRIVE HOOK (15) MOVES REARWARD, LIP "D" WILL MOVE DOWN UNDER ARM "B" OF U. CAM SHAFT FEED LATCH LOCATOR LINK (12). AS MAINSHAFT CONTINUES TO ROTATE, CAM ROLLER "C" WILL PASS UNDER FEED LATCH LINK (13) AND ALLOW U. CAM SHAFT FEED SEGMENT (22) TO RESTORE, ALLOWING RATCHET GEAR (23) TO RATCHET TO NORMAL.

17.2.7 WHEN U. CAM SHAFT IS AT "A" POSITION:

(1) U. CAM (30) IS HOLDING M & Q BRIDGE CONTROL SLIDE (31) PARTIALLY TO REAR. REAR PORTION OF M & Q BRIDGE CONTROL SLIDE (31) (PLATE 14) WILL PIVOT M & Q FINGER LOCATOR (35) AWAY FROM DIV. ESCAPEMENT TRIP FINGER (19) AND M & Q CONTROL SLIDE FINGER (36) (PLATE 13).

(2) U. CAM (29) IS LOCKED BY EAR ON KEYBOARD SUPPORT PLATE TO LOCK U. SHAFT TO LEFT.

(3) LEFT SIDE OF U. CAM (28) IS TO LEFT OF DIV. U. CAM SHIFT SLIDE (32) AND RIGHT SIDE IS IN POSITION TO BLOCK MULT U. CAM SHIFT SLIDE (27). THE LATTER IS EFFECTIVE AT "A" POSITION ONLY, WHEN MAINSHAFT IS AT NORMAL.

(4) U. CAM SHAFT DETENT GEAR (20) IS DETENTED AT "A" BY U. CAM SHAFT DETENT YOKE (16).

(5) RIGHT SIDE OF U. CAM (17) IS PUSHING CHARACTER FAN FINGER (18) TO ALIGN CHARACTER FAN (19) FOR CHARACTER RACK TO PRINT DIVISION SYMBOL.

(6) RIGHT SIDE OF U. CAM (83) (PLATE 13.3) IS PUSHING ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (82) TO REAR TO CAM ACCUMULATOR SECTION ACTUATOR HOOK (92) IN PATH OF FORWARD STROKE ACTUATING BAR.

17.2.8
AT THIS POINT, MAINSHAFT CONTINUES TO ROTATE, FORWARD STROKE ACTUATING BAR WILL ENGAGE BOTH LIST UNIT AND ACCUMULATOR UNIT WITH TRANSFER RACKS. LIST UNIT, RECALL UNIT AND TRANSFER CAM SHAFT DRIVE RACK WILL BE DRIVEN REARWARD, TRANSFERRING DIVIDEND FROM LIST UNIT TO ACCUMULATOR UNIT. ON SECOND HALF OF MAINSHAFT CYCLE, TRANSFER RACKS WILL ENTER DIVIDEND IN RECALL UNIT AND LIST UNIT WILL DISENGAGE AND BE RESET TO RIGHT. NEAR END OF MAINSHAFT CYCLE, FEATURE KEY LOCK BAR WILL BE RESTORED, ALLOWING THE FOLLOWING SLIDES TO NORMALIZE:

(1) MULT AND DIV. MOTOR TRIP SLIDE (19) (PLATE 4) WILL MOVE REARWARD, RELEASING MOTOR TRIP SHAFT (20) AND UNLOCKING DIGIT KEYS.

(2) M & D CONTROL SLIDE (25) (PLATE 13) MOVES FORWARD, CARRYING U. CAM SHAFT FEED LATCH LOCATOR LINK (12) FORWARD. THIS ALLOWS ARM "B" TO AGAIN BE POSITIONED IN FRONT OF U. CAM SEGMENT DRIVE HOOK (15).

17.2.8 (CONT'D.)

(3) DECIMAL KEY SLIDE (26) MOVES FORWARD AND, AT THIS TIME, M & Q CONTROL SLIDE FINGER (36) WILL MOVE UP INTO POSITION WITH M & Q BRIDGE (38) SINCE M & Q FINGER LOCATOR (35) HAS BEEN ROTATED AWAY FROM SLIDE FINGER (36).

(4) DIV. ESCAPEMENT RELEASE SLIDE (18) (PLATE 14) MOVES FORWARD AND, SINCE M & Q FINGER LOCATOR (35) HAS BEEN ROTATED AWAY FROM DIV. ESCAPEMENT TRIP FINGER (19) BY SLIDE (31) REAR PORTION OF DIV. ESCAPEMENT TRIP FINGER (19) WILL NOW DROP DOWN IN FRONT OF DIV. ESCAPEMENT SHAFT ARM (20).

(5) DIV. U. CAM SHAFT SHIFT SLIDE (32) WILL MOVE REARWARD TO NORMAL POSITION.

17.3 BLANK STROKE BEFORE DIVISOR

17.3.1
AFTER DIVISOR HAS BEEN ENTERED IN LIST UNIT, DIVISION KEY IS DEPRESSED THE SECOND TIME. THIS IS A POSITIONING STROKE WHICH IS NECESSARY TO PROPERLY CONDITION MACHINE FOR THE REMAINING STROKES. WHEN DIVISION KEY IS DEPRESSED THE SECOND TIME:

17.3.2
DIV. U. CAM SHAFT SHIFT SLIDE (32) MOVES TO FRONT; HOWEVER, IT PERFORMS NO SIGNIFICANT FUNCTION ON THIS STROKE.

17.3.3
DIV. ESCAPEMENT RELEASE SLIDE (18) (PLATE 14) MOVES TO REAR WITH DIV. ESCAPEMENT TRIP FINGER (19) CONTACTING DIV. ESCAPEMENT SHAFT ARM (20), ROTATING ESCAPEMENT SHAFT (16) WHICH WITHDRAWS ESCAPEMENT PAWL (15) FROM ESCAPEMENT RACK (13). LIST UNIT WILL NOW MOVE TO LEFT UNDER SPRING TENSION, ADDING ZEROS TO DIVISOR, UNTIL DIVISOR LOCATOR PLATE (14) LIMITS ON DIVISOR LOCATOR ARM (11). THIS WILL ALIGN LEFT COLUMN OF DIVISOR WITH LEFT COLUMN OF DIVIDEND.

ALSO, AT THIS TIME, AS DIV. ESCAPEMENT RELEASE SLIDE (18) MOVES REARWARD, M & D LIFT LINK LOCATOR (47) (PLATE 14.1) MOVES REARWARD AND, THROUGH ANGULAR SLOT IN M & D LIFT LINK (61) RIDING ON STUD IN M & D LIFT ARM (48), RAISES M & D ARM LOCATOR (57) SO M & D OPERATING FINGER (56) IS NOW ABOVE #1 SLIDE. (IT IS THROUGH THIS MECHANISM THAT VERTICAL POSITION OF M & D OPERATING FINGER (56) IS DETERMINED ON REMAINING STROKES.)

17.3.4
M & D CONTROL SLIDE (25) (PLATE 13) MOVES REARWARD, CARRYING U. CAM SHAFT FEED LATCH LOCATOR LINK (12) REARWARD WHICH CONTACTS AND ROTATES U. CAM SEGMENT DRIVE HOOK (15) OVER U. CAM SHAFT AUXILIARY FEED LATCH LINK (13).

17.3.5
DECIMAL KEY SLIDE (26) IS CARRIED TO REAR BY M & D CONTROL SLIDE (25) AND NOW, SINCE M & Q FINGER LOCATOR (35) HAS BEEN ROTATED AND ALLOWED M & Q CONTROL SLIDE FINGER (36) TO PIVOT, M & Q CONTROL SLIDE FINGER (36) WILL CONTACT M & Q BRIDGE (38), MOVING M & Q MECHANISM (37) REARWARD. REARWARD MOVEMENT OF M & Q MECHANISM (37) ROTATES MULT COUNTER CONTROL YOKE (8) AND ECCENTRIC STUD (5). DIVISOR UNIT CONTROL (19) (PLATE 13.1) WILL NOW BE ROTATED. ENGAGING MULT COUNTER CONNECTOR (7) WITH MULT COUNTER CONNECTOR RACK (54) ON LIST UNIT. WHEN LIST UNIT MOVES TO LEFT TO ALIGN DIVISOR WITH DIVIDEND, MULT COUNTER CONNECTOR (7) WILL MOVE MULT COUNTER FINGER (3) TO LEFT, ALIGNING IT WITH PROPER COLUMN OF MULT UNIT (ON A REGULAR DIVISION

17.3.5 (CONT'D)
PROBLEM THIS WOULD LOCATE MULT COUNTER FINGER (3) SO IT WOULD START COUNTING IN MULT UNIT COLUMN THAT IS IN LINE WITH LAST FIGURE MANUALLY ENTERED IN LIST UNIT).

AS MULT COUNTER FINGER (3) MOVES TO LEFT, DIVISOR UNIT CONTROL SHAFT (19) WILL ALSO MOVE TO LEFT WITH MULT COUNTER CONNECTING ACTUATOR ARM (58) (PLATE 14) CONTACTING BACKSPACE ACTUATING YOKE (6) AND MOVING IT TO LEFT, SO IT IS ALIGNED WITH LEFT FRONT PORTION OF BACKSPACE SLIDE (1).

REAR OF M & Q MECHANISM (37) (PLATE 13.1) ALSO CAUSES M & D DRIVE ARM (51) TO MOVE TO REAR, ALLOWING M & D ARM DRIVE LINK (59) TO REST ON TOP OF M & D MECHANISM DRIVE ARM (50). HOWEVER, M & D ARM DRIVE LINK (59) WILL NOT BE DRIVEN ON THIS OPERATION, IT IS ONLY LATCHED ON THIS STROKE.

17.3.6
M & D MOTOR TRIP SLIDE (19) (PLATE 4) MOVES FORWARD, AGAIN BLOCKING DIGIT KEYS, ROTATING MOTOR TRIP SHAFT AND ALLOWING FEATURE KEY LOCK BAR TO TRIP MOTOR AND LATCH ALL CONTROL SLIDES IN POSITION UNTIL END OF DIVISION PROBLEM.

17.3.7
BECAUSE LIST UNIT MOVED TO LEFT, RECALL UNIT CONTROL LATCH (68) (PLATE 13.2) MOVED FORWARD, AND AT THIS TIME AUTO RECALL LATCH RELEASE LINK (75) ALLOWS AUTO RECALL LATCH (76) TO OVER LATCH ON RECALL UNIT CONTROL BRACKET (59).

17.3.8
AS MAINSHAFT STARTS TO ROTATE, CAM ROLLER "C" (PLATE 13) WILL CONTACT AND PIVOT U. CAM SHAFT AUXILIARY FEED LATCH LINK (13), CAUSING IT TO CONTACT U. CAM SEGMENT DRIVE HOOK (15) MOVING IT AND U. CAM SHAFT SEGMENT DRIVE LINK (21) REARWARD. U. CAM SHAFT FEED SEGMENT (22) WILL ROTATE AND, THROUGH DRIVE RATCHET GEAR (23) AND U. CAM SHAFT SHIFT GEAR (28) ROTATE U. CAM SHAFT TO "B" POSITION. AS CAM ROLLER "C" PASSES UNDER FEED LATCH LINK (13), U. CAM SHAFT FEED SEGMENT WILL RESTORE, AND RATCHET GEAR (23) WILL RATCHET TO NORMAL, AND AT THIS TIME, U. CAM SEGMENT DRIVE HOOK (15) WILL MOVE UNDER FEED LATCH LOCATOR LINK (12) TO BE HELD OUT OF LATCHING POSITION WITH FEED LATCH LINK (13) FOR THE REMAINDER OF DIVISION PROBLEM.

17.3.9 WHEN U. CAM SHAFT IS AT "B" POSITION:

(1) U. CAM (30) IS HOLDING M & Q BRIDGE CONTROL SLIDE (31) FULLY TO REAR. AT THIS TIME, M & Q BRIDGE CONTROL SLIDE (31) CARRIES CONTINUOUS RUNNING SLIDE (39) (FIGURE 3) REARWARD TO KEEP MOTOR RUNNING FOR REMAINDER OF DIVISION PROBLEM.

(2) U. CAM (29) IS LOCKED BY EAR ON KEYBOARD SUPPORT PLATE TO LOCK U. SHAFT TO LEFT.

(3) LEFT SIDE OF U. CAM (28) IS TO LEFT OF DIV. U. CAM SHIFT SLIDE (32).

(4) U. CAM (20) IS DETENTED AT "B" BY U. CAM SHAFT DETENT YOKE (16).

(5) WHILE U. CAM SHAFT IS TURNING TO "B", U. CAM (26) (PLATE 14.1) CAMS DIV. LIST UNIT CONTROL YOKE (25). THIS ROTATES MULT LIST UNIT CONTROL SHAFT (111) AND, THROUGH MULT LIST UNIT FORWARD STROKE CONTROL SLIDE ACTUATOR FINGER (112) AND MULT LIST UNIT CONTROL SLIDE YOKE (77), MOVES LIST UNIT FORWARD STROKE SLIDE (28) FORWARD WITHDRAWING LIST UNIT FORWARD STROKE ACTUATOR HOOK FROM PATH OF FORWARD STROKE ACTUATING BAR.

(5) (CONT'D.)
AT SAME TIME, MULT LIST UNIT RETURN STROKE CONTROL ARM (110) MOVES FORWARD, PIVOTING MULT LIST UNIT RETURN STROKE CONTROL LINK (109) AND MULT LIST UNIT CONTROL SLIDE FINGER (108).

THUS, THROUGH THESE TWO ARMS, LIST UNIT REMAINS IN NORMAL POSITION FOR COMPLETE MAINSHAFT CYCLE.

MULT LIST UNIT CONTROL SHAFT (111) WILL BE HELD FORWARD BY LATCH (115) LATCHING ON FRONT PLATE UNTIL END OF THIS STROKE.

(6) RIGHT SIDE OF U. CAM (17) (PLATE 13) IS PUSHING CHARACTER FAN FINGER (18) TO ALIGN CHARACTER FAN (19) FOR CHARACTER RACK TO PRINT DIVISION SYMBOL.

(7) RIGHT SIDE OF U. CAM (83) (PLATE 13.3) IS PUSHING ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (82) TO REAR, CAMMING ACCUMULATOR SECTION ACTUATOR HOOK (92) IN PATH OF FORWARD STROKE ACTUATING BAR.

(8) U. CAM (37) (PLATE 14.2) IS PUSHING ADD-BACK SUBTRACT CONTROL ARM (35) TO REAR, CAMMING TOTAL STROKE SUBTRACT CONTROL SLIDE (63) (PLATE 8.3) TO REAR, PLACING SUBTRACT ACTUATOR HOOK (29) IN PATH OF FORWARD STROKE ACTUATING BAR. AT THIS TIME, ADD SUBTRACT ACTUATOR HOOK CONTROL LINK (62) MOVES TO REAR, PREVENTING LATCH RELEASE BELLCRANK (35) FROM CONTACTING ITS STUD. THUS SUBTRACT WHEELS WILL ALWAYS BE ENGAGED WITH ACCUMULATOR WHEELS UNTIL START OF ADD-BACK OPERATION.

(9) U. CAM (73) (PLATE 13.2) PUSHES LIST UNIT FORWARD STROKE HOOK MULT CONTROL SLIDE (74) TO REAR, WHICH CARRIES MULT LIST UNIT RETURN STROKE HOOK AND NON-PRINT RETURN STROKE HOOK CONTROL SLIDE (64) REARWARD AND PLACES NON-PRINT ACTUATOR HOOK (102) (PLATE 13.4) IN PATH OF RETURN STROKE ACTUATING BAR. HOWEVER, ON THIS STROKE, NON-PRINT BLOCK SLIDE (100) WILL NOT MOVE REARWARD TO LATCH NON-PRINT ACTUATOR HOOK (102).

AT SAME TIME, RECALL ACTUATOR HOOK CONTROL BELLCRANK (70) (PLATE 13.2) WILL BE PIVOTED BY MULT CONTROL SLIDE (74), WITHDRAWING CONTROL FINGER (67) AND RECALL RETURN STROKE ACTUATING HOOK (66) WHICH WILL KEEP RECALL UNIT OUT OF MESH UNTIL REMAINDER STROKE AND, THROUGH RECALL ACTUATING HOOK CONTROL LINK (71), ROTATES STORAGE CONTROL SHAFT (72) TO PREVENT RECALL UNIT FROM CLEARING ON FIRST HALF OF MAINSHAFT CYCLE, THEREBY RETAINING DIVIDEND IN RECALL UNIT.

17.3.10
AS MAINSHAFT CONTINUES TO ROTATE, ACCUMULATOR ACTUATING HOOK AND SUBTRACT ACTUATING HOOK WILL BE CONTACTED BY FORWARD STROKE ACTUATING BAR; HOWEVER, SINCE BOTH LIST UNIT AND RECALL UNIT ARE NOT ENGAGED, TRANSFER RACKS WILL REMAIN AT NORMAL POSITION, CHARACTER RACK WILL MOVE REARWARD, CAUSING THE DIVISION SYMBOL TO PRINT ON TAPE.

17.3.11
ON SECOND HALF OF CYCLE, RETURN STROKE ACTUATING BAR WILL ACTUATE NON-PRINT ACTUATING HOOK (102) (PLATE 13.4) PIVOTING NON-PRINT BELLCRANK (94), MOVING TYPE FIRING PLATE (93) AND NON-PRINT LINK (126) (FIGURE 4) TO RIGHT, PIVOTING NON-PRINT LINK ACTUATING FINGER (125). NON-PRINT LINK ACTUATING FINGER (125) SLIDES LIST UNIT RESET BELLCRANK (122) TO LEFT, THROUGH KEY (124) SO ROLL "F" IS NOT ALIGNED WITH LIST UNIT RESTORING MAINSHAFT CAM (123); THEREFORE, WHEN MAINSHAFT ROTATES, LIST UNIT WILL NOT BE RESTORED TO RIGHT.

17.3.12
NEAR END OF MAINSHAFT CYCLE, RETURN STROKE ACTUATING BAR RESTORES, ALLOWING NON-PRINT MECHANISMS TO RESTORE AND RACK RESET ARMS WILL ACTUATE NON-ADD LATCH RELEASE CAM (87) (PLATE 14.1) AND LIST UNIT CONTROL LATCH RELEASE LINK (86) WHICH WILL LIFT LATCH (115), ALLOWING MULT LIST UNIT CONTROL SHAFT (111) TO NORMALIZE, PLACING BOTH FORWARD AND RETURN LIST UNIT ACTUATOR STROKE HOOKS IN POSITION TO INTERCEPT THEIR RESPECTIVE ACTUATING BARS. DURING MAINSHAFT ROTATION, ROLL ON M & D DRIVE ARM (50) (PLATE 13.1) MOVES TO LOW SURFACE OF MAINSHAFT M & D DRIVE ARM CAM (49), LATCHING M & D ARM DRIVE LINK (59) TO DRIVE M & D FINGER (56) ON NEXT MAINSHAFT CYCLE.

17.4 DIVISOR PRINTING AND COUNTING CYCLE

17.4.1
DURING THIS AND FOLLOWING STROKES, U. CAM SHAFT WILL STAY AT "B" POSITION. ACCUMULATOR UNIT IS ENGAGED FOR FIRST HALF OF EACH STROKE, SUBTRACT WHEELS ARE MESHED WITH ACCUMULATOR INTERMEDIATE GEARS, LIST UNIT REMAINS ENGAGED FOR DURATION OF EACH STROKE (SUBTRACTING DIVISOR FROM DIVIDEND ON FIRST PORTION OF MAINSHAFT CYCLE AND RETAINING DIVISOR DURING SECOND PORTION OF MAINSHAFT CYCLE). MULT COUNTER FINGER INDEXES MULT UNIT GEAR ONE TOOTH FOR EACH STROKE. ON FIRST STROKE, DIVISOR WILL BE SUBTRACTED AND PRINTED. THE FOLLOWING STROKES WILL BE SUBTRACTED AND NON-PRINTED:

17.4.2
AS MAINSHAFT ROTATES, LOW SURFACE OF M & D LIFT LINK CAM (62) (PLATE 13.1) ALLOWS M & D LIFT ARM (48) TO LOWER M & D MECHANISM AND ALIGN M & D OPERATING FINGER (56) WITH UPPER PORTION OF #3 M & D SLIDE (26). AT THIS TIME, M & D DRIVE ARM CAM (49) ROTATES M & D DRIVE ARM (50) WHICH, LATCHED TO REAR OF M & D ARM DRIVE LINK (59), DRIVES M & D OPERATING ARM (60) AND M & D OPERATING FINGER (56) FORWARD. #3 M & D SLIDE (26) WILL THEN INDEX MULT UNIT GEAR FROM ZERO TO ONE.

17.4.3
AS MAINSHAFT CONTINUES TO ROTATE, ACCUMULATOR UNIT WILL ENGAGE WITH TRANSFER RACKS, SUBTRACT WHEELS WILL ENGAGE WITH ACCUMULATOR INTERMEDIATE GEARS AND LIST UNIT WILL ENGAGE WITH TRANSFER RACKS WHICH, WHEN ROTATED, WILL DRIVE TRANSFER RACKS TO REAR, SUBTRACTING DIVISOR FROM DIVIDEND AND PRINTING DIVISOR AND DIVISION SYMBOL.

17.4.4
ON SECOND HALF OF MAINSHAFT ROTATION, ACCUMULATOR SECTION RESTORES AND, AT THIS TIME; RETURN STROKE ACTUATING BAR (101) (PLATE 13.4) ROTATES NON-PRINT ACTUATOR HOOK (102), MOVING TYPE FIRING PLATE (93) TO RIGHT. THIS WILL AGAIN MOVE LIST UNIT RESET BELLCRANK (122) (FIGURE 4) TO LEFT, PREVENTING LIST UNIT RESTORE CAM (123) FROM RESTORING LIST UNIT TO RIGHT. TYPE FIRING PLATE (93) (PLATE 13.4) THRU SHAFT (A) ALSO DISENGAGES PLATEN FEED ARM (95) FROM CARRIAGE FEED BELLCRANK (96). DURING FIRST PORTION OF THIS CYCLE, WHEN LIST UNIT MOVED INTO MESH, NON-PRINT CONTROL LINK (99) PIVOTED, LIFTING FRONT END OUT OF PATH OF EAR ON NON-PRINT BLOCK SLIDE (100) AND, AS NON-PRINT ACTUATOR HOOK (102) IS ROTATED, NON-PRINT BLOCK SLIDE (100) WILL MOVE TO REAR UNDER LIP ON REAR ARM OF NON-PRINT ACTUATOR HOOK (102).

17.4.4 (CONT'D.)
THIS WILL HOLD NON-PRINT MECHANISM IN POSITION TO PREVENT PRINTING ACTION. THIS, IN TURN, WILL PREVENT LIST UNIT FROM RESTORING AND PREVENT PAPER BEING SPACED AND RIBBON FEED.

17.4.5
AS NON-PRINT BLOCK SLIDE (100) MOVED REARWARD, HIGH SPEED ACTUATOR BELLCRANK (97) PIVOTED, ROTATING HIGH SPEED CONTROL LEVER (98). THIS WILL PLACE MORE SPRING TENSION ON CONTACT BREAKER ARM, CAUSING MACHINE TO OPERATE AT HIGHER SPEED.

17.4.6
THIS ACTION IS REPEATED, I.E., DIVISOR SUBTRACTED FROM DIVIDEND AND MULT UNIT GEAR INDEXED ONE TOOTH FOR EACH STROKE UNTIL SUCH TIME AS THE SUBTRACTION OF THE DIVISOR CAUSED AN OVER-SUBTRACTION IN ACCUMULATOR UNIT.

17.5 OVER-SUBTRACTION ON DIVISION

17.5.1
WHEN DIVISOR HAS REDUCED DIVIDEND TO LESS THAN ZERO (ADD WHEELS ARE NOW NEGATIVE IN RESPECT TO ZERO) A CARRY-OVER WILL OCCUR TO THE LEFT. ALSO, WHEN SUBTRACT GEARS ARE ENGAGED WITH ACCUMULATOR INTERMEDIATE GEARS, CAMMING SURFACE ON ACCUMULATOR SECTION SUBTRACT ACTUATOR YOKE (32) (PLATE 14.2) ALLOWS SHAFT (33) AND ADD-BACK ACTUATING BAIL (34) TO MOVE TO RIGHT, PLACING EAR ON BAIL (34) IN LINE WITH ADD-BACK BAIL ACTUATING SLIDE (31). AS A CARRY-OVER OCCURS, ADD-BACK BAIL ACTUATING SLIDE (31) MOUNTED ON LAST CARRY SEGMENT WILL CONTACT AND ROTATE ADD-BACK ACTUATING BAIL (34) IN TURN LOWERING DIV. M & D LIFT MECHANISM LATCH CONTROL (30) WHICH, AT THIS TIME, HAS MOVED TO REAR. AT END OF THIS CYCLE, DIV. M & D LIFT MECHANISM LATCH CONTROL (30) MOVES FORWARD, PIVOTING DIV. ADD-BACK M & D LIFT LATCH (27), PLACING ITS UPPER STEP OVER M & D LIFT ARM (48) (PLATE 14.3).

17.5.2
DIV. ADD-BACK M & D LIFT LATCH (27) (PLATE 14.2) ALSO DRIVES ADD-BACK SHAFT ACTUATING LINK (39) TO REAR, ROTATING DIV. ADD-BACK SHAFT (38) WHICH, THROUGH RIGHT ARM (36), PIVOTS ADD-BACK SUBTRACT CONTROL ARM "A", ALLOWING TOTAL STROKE SUBTRACT CONTROL SLIDE (63) (PLATE 83) TO MOVE FORWARD, WITHDRAWING SUBTRACT ACTUATOR HOOK FROM PATH OF FORWARD STROKE ACTUATING BAR.

17.5.3
AT THIS TIME, MULT UNIT GEAR WHICH HAS BEEN INDEXED ONE TOOTH FOR EACH SUBTRACTION STROKE, HAS BEEN ROTATED ONE POSITION BEYOND THE TRUE QUOTIENT ANSWER.

17.6 ADD-BACK ON DIVISION

17.6.1
AS MAINSHAFT STARTS TO ROTATE ON THIS STROKE, LOW SURFACE OF M & D LIFT LEVER CAM (62) (PLATE 13.1) WILL ALLOW M & D LIFT ARM (48) TO RAISE UNTIL IT IS LIMITED BY DIV. ADD-BACK M & D LIFT LATCH (27) (PLATE 14.3). PIVOTING ACTION OF M & D LIFT ARM (48) WILL LOWER M & D ARM LOCATOR (57) THROUGH M & D LIFT LINK, ALIGNING M & D OPERATING FINGER (56) WITH #1 M & D SLIDE (24). AT THIS TIME, #1 M & D SLIDE WILL BE DRIVEN FORWARD, EFFECTING A REVERSE ROTATION OF MULT COUNTER FINGER (3) (PLATE 13.1) CAUSING MULT UNIT GEAR TO REVERT BACK ONE TOOTH.

17.6.2
FORWARD MOVEMENT OF #1 M & D SLIDE (24) WILL EFFECT A REARWARD MOVEMENT OF #3 M & D SLIDE (26). REAR OF #3 M & D SLIDE WILL CONTACT AND DETENT M & D ARM DIV. LOCATOR YOKE (25) (PLATE 14.4) REARWARD. THIS WILL PLACE HOOK "B" ON DIV. LOCATOR

17.6.2 (CONT'D)
YOKE (25) IN PATH OF M & D ARM LOCATOR (57) ON NEXT STROKE TO ALIGN M & D OPERATING FINGER (56) WITH #2 M & D SLIDE (22).

17.6.3
CONTINUED MAINSHAFT ROTATION WILL CAUSE ACCUMULATOR SUBTRACT ACTUATOR HOOK LATCH RELEASE BELLCRANK (35) (PLATE 8.3) TO ROTATE WHICH WILL UNLATCH ACCUMULATOR SUBTRACT ACTUATOR HOOK LATCH (43) FROM SUBTRACT ACTUATOR HOOK LATCH (30). THIS WILL PERMIT ACCUMULATOR WHEEL SECTION TO RESTORE TO ADD POSITION, ENGAGING ADD GEARS WITH ACCUMULATOR INTERMEDIATE GEARS. DURING REMAINDER OF CYCLE, THE VALUE IN THE LIST UNIT WILL BE RE-ADDED INTO ACCUMULATOR UNIT AND STILL RETAINED IN LIST UNIT.

ALSO, AS ACCUMULATOR SUBTRACT ACTUATOR HOOK LATCH (43) RELEASES SUBTRACT ACTUATOR HOOK LATCH (30), ACCUMULATOR SECTION SUBTRACT ACTUATOR YOKE (32) (PLATE 14.2) ROTATES, CAMMING SHAFT (33) AND ADD-BACK ACTUATING BAIL (34) TO LEFT. THIS WILL REMOVE ADD-BACK ACTUATING BAIL (34) FROM PATH OF ADD-BACK BAIL ACTUATING SLIDE (31) SO THAT DURING CARRY-OVER OPERATION ON THIS ADD-BACK STROKE, DIV. M & D LIFT MECHANISM LATCH CONTROL (30) WILL NOT BE RE-ACTUATED.

17.6.4
CONTINUED ROTATION OF MAINSHAFT WILLALLOWDIV. M & D LIFT MECHANISM LATCH CONTROL (30) TO MOVE REARWARD. THIS PERMITS DIV. ADD-BACK M & D LIFT LATCH (27) TO RELEASE M & D LIFT ARM ON NEXT STROKE. IT ALSO ALLOWS ADD-BACK SHAFT (38) TO RESTORE, PIVOTING ADD-BACK SUBTRACT CONTROL ARM "A" WHICH PUSHES TOTAL STROKE SUBTRACT CONTROL SLIDE (63) REARWARD, PLACING SUBTRACT ACTUATOR HOOK IN PATH OF FORWARD STROKE ACTUATING BAR FOR NEXT CYCLE.

17.6.5
AT END OF THIS STROKE, M & D LIFT ARM (48) (PLATE 13.1) WILL AGAIN BE DRIVEN DOWN BY ITS CAM AND, THROUGH M & D LIFT LINK (61), RAISE M & D ARM LOCATOR (57) AND M & D OPERATING FINGER (56).

17.7 BACKSPACING

17.7.1
AT BEGINNING OF BACKSPACING STROKE, M & D LIFT LINK CAM (62) (PLATE 13.1) WILL ROTATE, ALLOWING M & D LIFT ARM (48) TO PIVOT, AGAIN LOWERING M & D ARM LOCATOR (57) UNTIL IT RESTS ON HOOK "B" OF M & D ARM DIVISION LOCATOR YOKE (25) (PLATE 14.4). THIS ALIGNS M & D OPERATING FINGER (56) WITH #2 M & D SLIDE (22). AT THIS TIME, M & D OPERATING FINGER (56) AND #2 M & D SLIDE (22) (PLATE 14.1) WILL BE DRIVEN FORWARD WITH #2 M & D SLIDE ROTATING DIVISION LIST UNIT CONTROL YOKE (21) IN TURN DRIVING MULT LIST UNIT CONTROL SHAFT ACTUATING LINK (119) FORWARD. AT THIS POINT, LINK (119) WILL CONTACT AND PIVOT DIVISION ESCAPEMENT TRIP FINGER (19) (PLATE 14) WHICH NOW RELEASES FROM DIVISION ESCAPEMENT SHAFT ARM (20), ALLOWING ESCAPEMENT PAWL (15) (PLATE 14) TO ENGAGE WITH ESCAPEMENT RACK (13).

MULT LIST UNIT CONTROL SHAFT ACTUATING LINK (119) (PLATE 14.1), THROUGH MULT LIST UNIT SHAFT ACTUATING BELLCRANK (118) AND ARM (114), PLACES MULT LIST UNIT CONTROL SHAFT (111) IN LATCHED POSITION. AT THIS TIME, MULT LIST UNIT FORWARD STROKE CONTROL SLIDE ACTUATOR FINGER (112) CONTACTS MULT LIST UNIT CONTROL SLIDE YOKE (77) AND MOVES LIST UNIT FORWARD STROKE SLIDE (78) FORWARD. THIS WITHDRAWS LIST UNIT FORWARD STROKE ACTUATING HOOK (79) FROM PATH OF FORWARD STROKE ACTUATING BAR (80). ALSO, AT THIS TIME, MULT LIST UNIT RETURN STROKE CONTROL ARM (110) MOVES FORWARD, PIVOTING MULT LIST UNIT RETURN STROKE CONTROL LINK (109) AND MULT LIST UNIT CONTROL SLIDE FINGER (108), ALLOWING LIST UNIT RETURN STROKE ACTUATING HOOK (63) TO WITHDRAW FROM PATH OF RETURN STROKE ACTUATING BAR (101).

17.7.1 (CONT'D)
ACCUMULATOR SECTION WILL ENGAGE WITH TRANSFER RACKS AND ACCUMULATOR WHEEL SECTION WILL ROTATE, PLACING SUBTRACT GEARS IN MESH WITH ACCUMULATOR INTERMEDIATE GEARS AND AGAIN ALLOWING SHAFT (33) (PLATE 14.2) AND ADD-BACK ACTUATING BAIL (34) TO MOVE TO RIGHT; HOWEVER, NO SUBTRACTION WILL OCCUR ON THIS CYCLE BECAUSE LIST UNIT REMAINS DISENGAGED FOR REMAINDER OF CYCLE.

17.7.2
FURTHER, AS #2 M & D SLIDE (22) (PLATE 14) IS DRIVEN FORWARD, BACKSPACE ACTUATING BELLCRANK (23), CAUSES DIVISION LOCATOR YOKE NORMALIZER (4) TO MOVE TO REAR. AT THIS TIME, STUD ON (4) WILL CONTACT DIVISOR LOCATOR SHAFT CONTROL LATCH (8). THE LATTER IS RELEASED FROM TOP PLATE, DISENGAGING DIVISOR LOCATOR ARM (11) FROM DIVISOR LOCATOR RACK (12). SIMULTANEOUSLY, REAR OF DIVISION LOCATOR YOKE NORMALIZER (4) CONTACTS UPPER EAR "A" (PLATE 14.4) ON M & D ARM DIVISION LOCATOR YOKE (25) WHICH IS THEN DETENTED FORWARD. THIS REMOVES HOOK FROM UNDER M & D ARM LOCATOR (57) SO, ON NEXT CYCLE, M & D FINGER WILL ALIGN WITH #3 M & D SLIDE (26)

DIVISION LOCATOR YOKE NORMALIZER (4) (PLATE 14) ALSO OSCILLATES BACKSPACE ACTUATOR YOKE (6) WHICH IS STILL HELD TO LEFT, CAUSING THE LATTER TO DRIVE BACKSPACE SLIDE (1) REARWARD, PIVOTING BACKSPACE ARM (2) CAUSING BACKSPACE PAWL (3) TO ENGAGE AND ROTATE ESCAPEMENT RACK RESET GEAR (5). THIS RESETS LIST UNIT TO RIGHT ONE COLUMN. BACKSPACING OF LIST UNIT ALSO MOVES MULT COUNTER FINGER ONE COLUMN TO RIGHT THROUGH MULT COUNTER CONNECTOR RACK AND MULT COUNTER CONNECTOR. THUS, THE FOLLOWING SUBTRACTION STROKE WILL BE COUNTED IN THE NEXT MULT UNIT GEAR TO RIGHT.

17.7.3
AS MAINSHAFT COMPLETES THIS CYCLE, RACK RESET SHAFT WILL RELEASE LATCH (115) (PLATE 14.1) FROM FRONT PLATE, ALLOWING MULT LIST UNIT CONTROL SHAFT (111) TO RESTORE WHICH WILL ALLOW LIST UNIT ACTUATOR HOOK, FORWARD AND RETURN, TO MOVE REAR TO BE ENGAGED ON NEXT CYCLE.

17.8 SENSING END OF DIVISION
DIVISION OPERATIONS WILL BE REPEATED, E.G., COUNTING, OVER-SUBTRACTION, ADD-BACK AND BACKSPACE, UNTIL A SIGNIFICANT FIGURE IS PRESENT IN FIRST COLUMN. AT THIS TIME, LIST UNIT HAS CARRIED MULT COUNTER FINGER (3) (PLATE 13.1) TO RIGHT FOR COUNTING INTO FIRST MULT UNIT GEAR. ALSO AT THIS TIME, ZERO FINGER CARRYING ARM (4) WILL URGE DIVISOR UNIT CONTROL (19) TO RIGHT WHICH ALLOWS BACKSPACE ACTUATOR YOKE (6) (PLATE 14) TO RE-POSITION TO RIGHT, DISABLING BACKSPACING MECHANISM WHEN #2 M & D SLIDE (22) IS DRIVEN FORWARD AND POSITIONS RIGHT ARM OF BACKSPACE ACTUATOR YOKE (6) BEHIND STUD IN M & Q RELEASE ARM (4) (PLATE 13).

COUNTING, OVER-SUBTRACTION AND ADD-BACK STROKES ARE AGAIN REPEATED WITH MULT COUNTER FINGER OPERATING IN UNITS COLUMN OF MULT UNIT. THIS CONDITIONS MACHINE TO AGAIN DRIVE #2 M & D SLIDE FORWARD.

17.9 REMAINDER ON DIVISION

17.9.1
ON THIS CYCLE, U. CAM SHAFT IS ROTATED TO "C" POSITION. THIS CONDITIONS THE MACHINE TO DRIVE AND PRINT REMAINDER OF DIVIDEND FROM ACCUMULATOR UNIT, PRINT REMAINDER, RESTORE LIST UNIT TO RIGHT AND PLACE REMAINDER IN RECALL UNIT. (AFTER MACHINE HAS BEEN CONDITIONED TO DRIVE THE REMAINDER, OPERATION IS THEN SIMILAR TO TOTAL KEY OPERATION.)

17.9.2
AT END OF LAST ADD-BACK STROKE, M & D DIVISION LOCATOR YOKE (25) (PLATE 14.4) WAS POSITIONED TO INTERCEPT M & D ARM LOCATOR (57) TO ALIGN M & D OPERATING FINGER (56) WITH #2 M & D SLIDE (22) AND, ON THIS STROKE, AS #2 M & D SLIDE IS OPERATED, BACKSPACE ACTUATOR YOKE (6) (PLATE 14) (WHICH NOW IS TO THE RIGHT) ROCKS M & Q RELEASE ARM (4) (PLATE 13.1) WHICH, THROUGH ITS SHAFT, ROCKS U. CAM SHAFT AUXILIARY FEED CONTROL (1). M & Q RELEASE ARM (4) PIVOTS M & Q BRIDGE (38) WHICH, RELEASING FROM M & Q CONTROL SLIDE FINGER (36), ALLOWS M & Q BRIDGE MECHANISM TO RESTORE TO FRONT, RESTORING MULT CONTROL CONNECTOR (7) OUT OF MULT COUNTER CONNECTOR RACK (54) AND ROTATES M & D DRIVE ARM (51) FORWARD WHICH WILL RELEASE M & D ARM DRIVE LINK (59) ABOVE STEP ON M & D MECHANISM DRIVE ARM (50) THUS PREVENTING ANY FURTHER DRIVING ACTION BY M & D OPERATING FINGER (56) ON FOLLOWING STROKES.

SIMULTANEOUSLY, U. CAM SHAFT AUXILIARY FEED CONTROL (1) (PLATE 13) MOVES INTO A LATCHING POSITION WITH CONTROL LATCH (10) UNTIL END OF DIVISION PROBLEM. AT THIS TIME, STUD ON AUXILIARY FEED CONTROL (1) LOWERS U. CAM AUXILIARY FEED LATCH (24) OVER FLAT STUD ON U. CAM SEGMENT DRIVE LINK (14) AND, BECAUSE U. CAM SHIFT AUXILIARY FEED LATCH LINK (13) DRIVES ON EACH MAINSHAFT CYCLE, U. CAM SHAFT FEED SEGMENT (22) WILL ROTATE U. CAM SHAFT TO "C" POSITION. U. CAM AUXILIARY FEED LATCH (24) WILL NOW REMAIN ENGAGED WITH FLAT STUD ON U. CAM SEGMENT DRIVE LINK (14) EFFECTING A ROTATION OF U. CAM SHAFT ONE POSITION ON EACH OF THE TOW FOLLOWING STROKES. DURING THIS TIME, DIVISION LOCATOR YOKE NORMALIZER (4) (PLATE 14) HAS RESET DIVISION LOCATOR YOKE (25) TO NORMAL POSITION.

17.9.3 WHEN U. CAM SHAFT IS AT "C" POSITION":

(1) U. CAM (30) (PLATE 13) IS HOLDING M & Q BRIDGE CONTROL SLIDE (31) FULLY TO REAR, CARRYING CONTINUOUS RUNNING SLIDE (39) (FIGURE 3) REARWARD TO KEEP MOTOR RUNNING.

(2) U. CAM (29) (PLATE 13) IS LOCKED BY EAR ON KEYBOARD SUPPORT PLATE TO LOCK U. CAM SHAFT TO LEFT.

(3) LEFT SIDE OF U. CAM (28) IS TO LEFT OF DIV. U. CAM SHIFT SLIDE (32).

(4) U. CAM (20) IS DETENTED AT "C" BY U. CAM SHAFT DETENT YOKE (16).

(5) LOW SURFACE OF U. CAM (17) ALLOWS CHARACTER FAN FINGER (18) TO FALL TO REAR, LOWERING CHARACTER FAN. THUS, ALL STOPS FOR CHARACTER RACK ARE REMOVED AND CHARACTER RACK WILL THEN TRAVEL REARWARD UNTIL IT LIMITS ON STUD IN CENTER FRAME, ROTATING PRINTING WHEEL TO PRINT A REMAINDER (C) SYMBOL.

(6) RIGHT SIDE OF U. CAM (83) (PLATE 13.3) IS HOLDING ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (82) TO REAR, PLACING ACCUMULATOR SECTION ACTUATOR HOOK (92) IN PATH OF FORWARD STROKE ACTUATING BAR. THUS, ON THIS STROKE, ACCUMULATOR SECTION WILL ENGAGE WITH TRANSFER RACKS.

(7) MIDDLE CAM ON U. CAM (19) (PLATE 6) IS HOLDING TOTAL SUB-TOTAL SLIDE (64) (PLATE 8.3) REARWARD AND, THROUGH LATCH (66) DRIVES TOTAL STROKE SUBTRACT CONTROL SLIDE (63), PLACING SUBTRACT ACTUATOR HOOK ASSEMBLY IN MESH WITH FORWARD STROKE ACTUATING BAR.

(7) (CONT'D.)
TOTAL SUB-TOTAL SLIDE (64) FULCRUMS TOTAL DRIVE RACK CONTROL LINK (67), ROTATING TOTAL DRIVE RACK CONTROL YOKE (70) AWAY FROM TOTAL RACK ACTUATING FINGER (71).

(8) LEFT CAM ON U. CAM (73) (PLATE 13.2) CAMS MULT LIST UNIT CONTROL SLIDE YOKE (77) WHICH MOVES LIST UNIT FORWARD STROKE SLIDE (78). WITHDRAWING LIST UNIT FORWARD STROKE ACTUATING HOOK (79) FROM PATH OF FORWARD STROKE ACTUATING BAR.

AT THIS TIME, RIGHT CAM ON U. CAM (73) HAS RELEASED LIST UNIT FORWARD STROKE HOOK MULT CONTROL SLIDE (74) WHICH, IN TURN, ALLOWS MULT LIST UNIT RETURN STROKE HOOK AND NON-PRINT RETURN STROKE HOOK CONTROL SLIDE (64) TO RESTORE TO FRONT. THIS WITHDRAWS NON-PRINT ACTUATOR HOOK (102) (PLATE 13.4) AND LIST UNIT RETURN STROKE ACTUATOR HOOK (63) (PLATE 13.2) FROM PATH OF RETURN STROKE ACTUATING BAR (101) AND, AT SAME TIME, NON-PRINT CONTROL LINK (99) (PLATE 13.4) WILL RESTORE FORWARD, RELEASING REAR ARM OF NON-PRINT ACTUATOR HOOK (102). THE LATTER WILL PERMIT NON-PRINT BELLCRANK (94), TYPE FIRING PLATE (93), LIST UNIT RESET BELLCRANK (122) (FIGURE 4) TO RESTORE AND AGAIN ALLOW PLATEN FEED ARM (95) (PLATE 13.4) AND CARRIAGE FEED BELLCRANK (96) TO ENGAGE. NON-PRINT CONTROL LINK (99), AS IT MOVES FORWARD, ALSO REDUCES MACHINE SPEED THROUGH ITS ASSOCIATED PARTS.

FURTHER, LIST UNIT FORWARD STROKE HOOK MULT CONTROL SLIDE (74) (PLATE 13.2) RELEASES RECALL ACTUATOR HOOK CONTROL BELLCRANK (70) ALLOWING STORAGE CONTROL SHAFT (72) TO RESTORE. RECALL UNIT GEARS WILL NOW BE RESTORED TO NORMAL WHEN RECALL UNIT LOCK PLATE RELEASE RACK MOVES REARWARD.

17.9.4
AS MAINSHAFT CONTINUES TO ROTATE, REMAINDER IS TAKEN FROM ACCUMULATOR UNIT (SEE TOTAL KEY OPERATION). REMAINDER AND ITS SYMBOL (O) ARE PRINTED IN RED. DURING SECOND HALF OF MAINSHAFT CYCLE, RETURN STROKE ACTUATING BAR WILL ENGAGE RECALL UNIT STORING REMAINDER IN RECALL UNIT AND LIST UNIT IS RESTORED TO RIGHT IN CONVENTIONAL MANNER.

17.10 QUOTIENT

17.10.1
DURING THIS STROKE, U. CAM SHAFT WILL BE ROTATED TO "D" POSITION. MULT UNIT WILL BE ENGAGED WITH TRANSFER RACKS CAUSING MULT UNIT GEARS TO PRINT QUOTIENT. DIVISOR WILL BE CLEARED OUT OF LIST UNIT GEARS AND QUOTIENT WILL BE STORED IN RECALL UNIT.

17.10.2
ROTATION OF MAINSHAFT CAUSES M & D ARM LOCATOR (57) (PLATE 13.1) TO TRAVEL DOWNWARD WITH M & D ARM LOCATOR HOOK (55) URGING LEFT ARM OF ZERO DROP-IN BAR (1) TO LIMIT ON TOP OF M & D ARM LOCATOR LIMIT (6) WHICH, BEING PART OF M & Q BRIDGE MECHANISM, MOVED UNDER ZERO DROP-IN BAR ON REMAINDER STROKE. THIS IS NORMAL POSITION FOR M & D ARM LOCATOR (57) AND IT WILL RETURN TO THIS POSITION FOR ALL OPERATIONS EXCEPT MULTIPLICATION. THUS, M & D ARM LOCATOR LIMIT (6) IS LIMITING BOTH ZERO DROP-IN BAR (1) AND M & D ARM LOCATOR (57).

17.10.3
AS MAINSHAFT CONTINUES TO ROTATE ON THIS CYCLE, U. CAM SHAFT AUXILIARY FEED LATCH LINK (13) (PLATE 13) WILL BE ROTATED AND, THROUGH U. CAM AUXILIARY FEED LATCH (24), DRIVE U. CAM SHAFT FEED SEGMENT (22) ROTATING U. CAM SHAFT TO "D" POSITION.

17.10.4 WHEN U. CAM SHAFT IS AT "D" POSITION:

(1) U. CAM (30) IS HOLDING M & Q BRIDGE CONTROL SLIDE (31) FULLY TO REAR, CARRYING CONTINUOUS RUNNING SLIDE (39) (FIGURE 3) REARWARD TO KEEP MOTOR RUNNING.

(2) U. CAM (29) IS LOCKED BY EAR ON KEY BOARD SUPPORT PLATE TO LOCK U. CAM SHAFT TO LEFT.

(3) LEFT SIDE OF U. CAM (28) IS TO LEFT OF DIV. U. CAM SHIFT SLIDE (32).

(4) U. CAM (33) (PLATE 6) IS HOLDING MULT DRIVE RACK CONNECTOR BELLCRANK (32) FORWARD, ALLOWING MULT RACK ACTUATING FINGER (30) TO CONNECT MULT DRIVE RACK (35).

(5) U. CAM (20) (PLATE 13) IS DETENTED AT "D" BY U. CAM SHAFT DETENT YOKE (16).

(6) U. CAM (17) PUSHES CHARACTER FAN FINGER (18), ALIGNING CHARACTER FAN TO STOP CHARACTER RACK AT DIVISION TOTAL "T" PRINTING POSITION.

(7) RIGHT SIDE OF U. CAM (12) (PLATE 13.1) IS PUSHING MULT TOTAL SLIDE (11) REARWARD. THIS WILL URGE MULT UNIT ACTUATOR HOOK (13) REARWARD WHERE IT WILL INTERCEPT FORWARD STROKE ACTUATING BAR AND ENGAGE MULT UNIT WITH TRANSFER RACKS ON FIRST HALF OF CYCLE.

(8) U. CAM (83) (PLATE 13.3) HAS RELEASED ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (82) WHICH, BY MOVING FORWARD, WITHDRAWS ACCUMULATOR SECTION ACTUATOR HOOK (92).

(9) CENTER CAM ON U. CAM (19) (PLATE 6) HAS RELEASED TOTAL SUB-TOTAL SLIDE (64) (PLATE 8.3). TOTAL STROKE SUBTRACT CONTROL SLIDE (63) IS PREVENTED FROM RESTORING ON THIS CYCLE BY ACCUMULATOR SUBTRACT ACTUATOR HOOK LATCH RELEASE BELLCRANK (35).

(10) LEFT CAM ON U. CAM (73) (PLATE 13.2) RELEASES MULT LIST UNIT CONTROL SLIDE YOKE (77) WHICH, THROUGH ITS SLIDE, PLACES LIST UNIT FORWARD STROKE ACTUATOR HOOK TO REAR, WHERE IT WILL BE ACTUATED TO CAUSE LIST UNIT DRIVE GEAR TO MESH WITH ITS RESPECTIVE RACK. ON THIS STROKE, AS LIST UNIT, RECALL UNIT AND TRANSFER CAM SHAFT DRIVE RACK MOVE REARWARD, LIST UNIT GEARS WILL BE ROTATED TO ZERO POSITION.

17.10.5
CONTINUED ROTATION OF MAINSHAFT WILL NOW DRIVE MULT DRIVE RACK AND LIST UNIT, RECALL UNIT AND TRANSFER CAM SHAFT DRIVE RACK TO REAR. THE LATTER WILL RESET LIST UNIT GEARS TO NORMAL POSITION WHILE MULT DRIVE RACK WILL, THROUGH MULT UNIT GEARS, DRIVE TRANSFER RACKS TO PRINT QUOTIENT. CHARACTER RACK CAUSES DIVISION TOTAL SYMBOL (T) TO BE PRINTED. (PRINTING IS IN RED.) IT IS DURING THIS TIME THAT TOTAL STROKE SUBTRACT CONTROL SLIDE (63) (PLATE 8.3) RESTORES TO FRONT AND SUBTRACT ACTUATOR HOOK (29) IS WITHDRAWN. DURING THIS TIME, RECALL UNIT GEARS HAVE BEEN CLEARED AND AGAIN ENGAGED ON SECOND HALF OF CYCLE TO STORE THE QUOTIENT.

17.11 BLANK STROKE AFTER QUOTIENT

17.11.1
DURING THIS STROKE, U. CAM SHAFT IS ROTATED TO "E" POSITION (NORMAL), LIST UNIT ENGAGES WITH FLEXIBLE PLATE BUT PERFORMS NO FUNCTION AND RECALL UNIT REMAINS DISENGAGED FOR COMPLETE CYCLE TO RETAIN QUOTIENT IN RECALL UNIT GEARS.

17.11.2
AS MAINSHAFT ROTATES, U. CAM SHAFT AUXILIARY FEED LATCH LINK (13) (PLATE 13) IS ROTATED, AGAIN DRIVING U. CAM SHAFT FEED SEGMENT (22), ROTATING U. CAM SHAFT TO "E" POSITION; ALSO, SUBTRACT HOOK RELEASE LATCH (35) (PLATE 8.3) UNLATCHES SUBTRACT ACTUATOR HOOK LATCH (30) AND ACCUMULATOR WHEEL SECTION REVERTS BACK TO ADD CONDITION.

17.11.3
WHILE U. CAM SHAFT ROTATES TO "E" POSITION, U. CAM (43) (PLATE 7.2) CAMS MULT RECALL CONTROL UPPER SECTION (42), ROTATING RECALL UNIT CONTROL SHAFT WHICH, THROUGH MULT RECALL LOCK ACTUATOR FINGER (38) ROTATES STORAGE CONTROL SHAFT (26). THIS ACCOMPLISHES TWO THINGS - PREVENTS RECALL UNIT GEARS FROM BEING CLEARED ON FIRST PORTION OF CYCLE AND WITHDRAWS RECALL UNIT RETURN STROKE ACTUATOR HOOK CONTROL FINGER (20) SO RECALL UNIT WILL NOT BE ENGAGED ON SECOND HALF OF CYCLE.

17.11.4
AS MAINSHAFT CONTINUES TO ROTATE, LIST UNIT WILL BE LOWERED; HOWEVER, NO OPERATION WILL TAKE PLACE. TRANSFER RACK REMAINS FORWARD AND BLANK STROKE AFTER QUOTIENT SYMBOL (0) IS PRINTED IN BLACK.

17.11.5 WHEN U. CAM SHAFT IS AT "E" POSITION:

(1) U. CAM (30) (PLATE 13) RELEASES M & Q BRIDGE CONTROL SLIDE (31) AND CONTINUES RUNNING SLIDE (39) (FIGURE 3). BOTH SLIDES WILL MOVE FORWARD WITH THE LATTER ROTATING CONTINUOUS RUNNING BELLCRANK (42) WHICH WILL ALLOW FULL STROKE ARM LIFT LINK (41) TO MOVE TO REAR AND, ON THIS STROKE, WILL THEN RESET FEATURE KEY LOCK BAR, TERMINATING THE DIVISION OPERATION.

(2) U. CAM (29) (PLATE 13) IS NOW ROTATED SO NOTCH IN CAM IS ALIGNED WITH EAR ON KEYBOARD SUPPORT PLATE. THUS, U. CAM SHAFT IS NOW IN A POSITION TO MOVE TO RIGHT; HOWEVER, IT IS STILL HELD TO LEFT BY DIV. U. CAM SHIFT SLIDE (32).

(3) U. CAM (28) IS HELD TO LEFT AND, IN TURN, HOLDS U. CAM SHAFT TO LEFT BY DIV. U. CAM SHIFT SLIDE (32).

(4) U. CAM (20) IS DETENTED AT "E" POSITION.

(5) U. CAM (17) ALLOWS CHARACTER FAN FINGER (18) TO MOVE TO LOW SURFACE OF CAM, LOWERING CHARACTER FAN. THUS, ALL STOPS FOR CHARACTER RACK ARE REMOVED AND CHARACTER RACK WILL THEN TRAVEL REARWARD UNTIL IT LIMITS ON STUD IN CENTER FRAME, ROTATING PRINTING WHEEL TO PRINT BLANK STROKE AFTER QUOTIENT SYMBOL (0).

(6) U. CAM (12) (PLATE 13.1) HAS RELEASED MULT-TOTAL SLIDE (11) EFFECTING THE WITHDRAWAL OF MULT UNIT ACTUATOR HOOK (13) FROM PATH OF FORWARD STROKE ACTUATING BAR.

17.11.6
AS MAINSHAFT CONTINUES TO ROTATE, FEATURE KEY LOCK BAR WILL BE RESTORED AND MOTOR WILL BE INTERRUPTED, COMPLETING A DIVISION PROBLEM. AT THIS TIME, FOLLOWING SLIDES WILL RESTORE TO NORMAL POSITION, READY FOR NEXT OPERATION.

(1) DIV. U. CAM SHIFT SLIDE (32) (PLATE 13) MOVES TO REAR, RELEASING U. CAM (28) WHICH IN TURN, ALLOWS U. CAM SHAFT TO MOVE TO RIGHT (NORMAL POSITION) RELEASING INTERLOCKS FOR ADD, SUBTRACT, SUB-TOTAL, TOTAL AND MULT AND DIVISION SUB-TOTAL KEYS.

(2) DIV. ESCAPEMENT RELEASE SLIDE (18) (PLATE 14) MOVES FORWARD.

(3) M & D CONTROL SLIDE (25) (PLATE 13) MOVES FORWARD.

(4) DECIMAL KEY SLIDE (26) RESTORES TO FRONT.

(5) M & D MOTOR TRIP SLIDE (45) (FIGURE 1) MOVES REARWARD AND, IN SO DOING, REMOVES INTERLOCK FOR DIGIT KEYS.

17.11.7
AS FEATURE KEY LOCK BAR RESTORES, AUTO RECALL LATCH RELEASE LINK (75) (PLATE 13.2) WILL UNLATCH AUTO RECALL LATCH (76) AND ALLOW RECALL UNIT CONTROL LATCH (68) TO PLACE BOTH RECALL ACTUATOR HOOKS IN THE PATH OF THEIR RESPECTIVE ACTUATING BARS.

17.11.8
AS MAINSHAFT ROTATED TO NORMAL, RACK RESET ARMS UNLATCHED RECALL UNIT CONTROL SHAFT WHICH RELEASES STORAGE CONTROL SHAFT. THIS RESTORES RECALL UNIT MECHANISMS TO NORMAL AND ALLOWS RECALL UNIT RETURN STROKE ACTUATOR HOOK CONTROL FINGER (67) TO MOVE REARWARD.

17.11.9
AT TIME FEATURE KEY LOCK BAR RESTORES, FULL STROKE ARM (9) (PLATE 13) WILL RAISE LINK (11), ROTATING CONTROL LATCH (10) WHICH UNLATCHES U. CAM SHAFT AUXILIARY FEED CONTROL (1). THIS ALLOWS STUD ON U. CAM SHAFT AUXILIARY FEED CONTROL (1) TO UNLATCH FEED LATCH (24) FROM FLAT STUD ON U. CAM SEGMENT DRIVE LINK (14), PREVENTING ROTATION OF U. CAM SHAFT ON NEXT OPERATIONS.

XVIII. STOP KEY MULTIPLICATION

18.1
DEPRESSION OF STOP KEY DURING MULTIPLICATION CAMS STOP KEY SLIDE AND STOP KEY LINK (PLATE 14.5) REARWARD. STOP KEY SLIDE IS LATCHED REARWARD BY FEATURE KEY LOCK BAR.

18.2
WHEN STOP KEY LINK (40) BECOMES LOCATED UNDER M & D ARM LOCATOR (57), M & D OPERATING FINGER (56) (PLATE 13.1) WILL BE ALIGNED WITH #2 M & D SLIDE (22) (PLATE 14) AND, AS IT IS DRIVEN FORWARD, DIVISOR ACTUATOR YOKE (6) WILL CONTACT STUD IN M & D RELEASE ARM ARM (4) (PLATE 13) CAUSING M & Q BRIDGE MECHANISM TO RESTORE. THUS, ON FIRST PORTION OF THIS CYCLE, UNIVERSAL CAM SHAFT IS ROTATED TO "C" POSITION AND REST OF MULTIPLICATION PROBLEM IS COMPLETED IN USUAL MANNER. IT SHOULD BE NOTED THAT, ON THIS CYCLE, AS MULT UNIT IS ENGAGED WITH TRANSFER RACKS, REMAINDER OF MULTIPLIER IS DRIVEN OUT OF MULT UNIT GEARS.

18.3
IF NO SIGNIFICANT FIGURE(S) IS ENTERED IN LIST UNIT FOR MULTIPLICAND AND MULT KEY IS DEPRESSED AND IF, DURING CYCLING, STOP KEY IS DEPRESSED, MACHINE WILL COMPLETE THE PROBLEM AFTER LIST UNIT IS BACKSPACED ALL THE WAY TO THE RIGHT. (SIMILAR TO DIVISION)

XIX. STOP KEY, DIVISION

19.1
DEPRESSION OF STOP KEY DURING DIVISION CAMS STOP KEY SLIDE AND STOP KEY LINK (40) (PLATE 14.5) REARWARD. STOP KEY SLIDE IS LATCHED REARWARD BY FEATURE KEY LOCK BAR.

19.2
WHEN STOP KEY LINK (40) BECOMES LOCATED UNDER M & D ARM LOCATOR (57), M & D OPERATING FINGER (56) (PLATE 13.1) WILL BE ALIGNED WITH #2 M & D SLIDE (22) (PLATE 14) AND, AS IT IS DRIVEN FORWARD, CAUSE A BACKSPACE OPERATION. THE BACKSPACING OPERATION WILL BE REPEATED UNTIL A SIGNIFICANT FIGURE IS PRESENT IN UNITS COLUMN AT WHICH TIME, DIVISOR ACTUATOR YOKE (6) WILL BE RE-POSITIONED TO RIGHT AND THE DIVISION PROBLEM WILL THEN BE COMPLETED IN USUAL MANNER.

XX. DECIMAL KEY

20.1
DECIMAL KEY MAY BE USED ANY TIME BEFORE OR AFTER ANY DIGIT OF THE DIVISOR. IN EFFECT, THIS MOVES THE DECIMAL POINT IN QUOTIENT TO THE RIGHT AS MANY PLACES AS THERE ARE DIGITS TO THE RIGHT OF THE DECIMAL POINT IN THE DIVISOR.

20.2
AFTER DIVIDEND HAS BEEN ENTERED IN MACHINE, M & Q CONTROL SLIDE FINGER (36) (PLATE 13.1) IS ALIGNED WITH M & Q BRIDGE (38). THEREFORE, WHEN DECIMAL KEY IS DEPRESSED, DECIMAL KEY SLIDE (26) WILL MOVE REARWARD, WHICH, THROUGH M & Q CONTROL SLIDE FINGER (36) PUSHES M & Q BRIDGE (38) REARWARD, MOVING M & Q MECHANISM (37) REARWARD. REARWARD MOVEMENT OF M & Q MECHANISM (37) ROTATES MULT COUNTER CONTROL YOKE (8) AND ECCENTRIC STUD (5), DIVISOR UNIT OF CONTROL (19) WILL NOW BE ROTATED, ENGAGING MULT COUNTER CONNECTOR (7) WITH MULT COUNTER CONNECTOR RACK ON LIST UNIT AND ALLOW DIVISOR UNIT COLUMN CONTROL LATCH (53) (PLATE 15) TO REST AGAINST FRONT PORTION OF DIVISOR UNIT CONTROL FINGER (52). NOW, AS DIGITS ARE ENTERED, MULT COUNTER CONNECTOR (7) (PLATE 13.1) WILL MOVE MULT COUNTER FINGER (3) TO LEFT. ANY DIGIT ENTERED FOLLOWING THE DEPRESSION OF DECIMAL KEY WILL CAUSE THE QUOTIENT TO BE CARRIED ONE SPACE TO THE LEFT. (IN EFFECT, ADDING ZEROS TO THE RIGHT OF TRUE QUOTIENT ANSWER).

WHEN DECIMAL KEY HAS BEEN USED WHILE PLACING DIVISOR INTO LIST UNIT, BACKSPACING OF THE DIVISOR WILL PREVENT MULTIPLY COUNTER ASSEMBLY FROM REACHING UNITS POSITION OF MULTIPLY UNIT; THEREFORE, END OF PROBLEM CANNOT BE DETECTED AS EXPLAINED UNDER SENSING END OF DIVISION (17.8).

20.3
WHEN A SIGNIFICANT FIGURE IS BACKSPACED INTO UNITS COLUMN AND UNITS COLUMN TRANSFER RACK IS DRIVEN REARWARD, UNITS COLUMN DIVISOR CONTROL RACK (41) (PLATE 15) IS ALSO DRIVEN REARWARD. THE DIVISOR UNIT COLUMN CONTROL FINGER (52), ENGAGED IN NOTCH OF THE UNITS COLUMN DIVISOR CONTROL RACK (41), IS THEN ROTATED WITH FRONT PORTION CONTACTING SLIDING CAM (40) AND CAMMING DIVISOR UNIT CONTROL (19) TO RIGHT. DIVISOR UNIT CONTROL FINGER (52) IS LATCHED BY CONTROL LATCH (53).

20.4
AS DIVISOR UNIT CONTROL (19) IS CAMMED TO RIGHT, DIVISOR ACTUATOR YOKE (6) (PLATE 14) IS RE-POSITIONED TO RIGHT, DISENGAGING IT FROM BACKSPACE SLIDE (1) AND INTO ENGAGEMENT WITH M & Q RELEASE ARM (4) (PLATE 13.1). ON NEXT OPERATION, AS DIVISOR ACTUATOR YOKE (6) (PLATE 14) IS OPERATED, M & Q BRIDGE WILL THEN BE RELEASED AND REMAINING CYCLES WILL CONTINUE AS AN ORDINARY DIVISION PROBLEM.

20.5
DECIMAL KEY RESTORES ON SECOND DEPRESSION OF MULT OR DIV. KEYS.

20.6
IN MULTIPLICATION, THE FIRST FACTOR (MULTIPLIER) IS ENTERED INTO THE MACHINE. IF A DECIMAL IS TO BE USED IN THE SECOND FACTOR, OR MULTIPLICAND, IT IS NECESSARY TO PLACE ZEROS AFTER THE FIGURES OF THE FIRST FACTOR, IN AN AMOUNT TO EQUAL THE FIGURES FOLLOWING THE DECIMAL KEY DEPRESSION IN THE SECOND FACTOR.

XXI. MULTIPLY SUB-TOTAL KEY

21.1
THIS KEY, USED IN RETAINING A TOTAL AT END OF A MULTIPLICATION OPERATION OR RETAINING A QUOTIENT IN ACCUMULATOR SECTION ON DIVISION, MUST BE LATCHED DOWN BEFORE STARTING A PROBLEM.

21.2
WHEN M & D SUB-TOTAL KEY IS DEPRESSED, MULTIPLY SUB-TOTAL KEY LATCH LATCHES KEY DOWN WHEN MACHINE IS NORMAL AND MULTIPLY SUB-TOTAL LOCK SLIDE, HELD REARWARD BY FEATURE KEY LOCK BAR, SERVES AS AN INTERLOCK SO THIS KEY MAY NOT BE RELEASED DURING THE CYCLING OPERATIONS. ALSO, MULTIPLY SUB-TOTAL SLIDE MOVES FORWARD.

21.3
IN MULTIPLICATION, MULTIPLY SUB-TOTAL SLIDE IS MOVED FORWARD AND BLOCKS LATERAL MOVEMENT OF U. CAM TO CONTROL MULT SUB-TOTAL (1) (PLATE 16) AS U. CAM SHAFT SHIFTS TO RIGHT ON MULTIPLIER STROKE. U. CAM (1) IS HELD IN LINE TO OPERATE SUB-TOTAL KEY ACTUATING LINK (2) WHEN U. CAM SHAFT IS IN "D" POSITION.

NOW, WHEN SUB-TOTAL KEY ACTUATING LINK (2) OPERATES, SUBTRACT BAIL (11) IS ROCKED, WITH RIGHT ARM "A" CAMMING SUB-TOTAL CHARACTER SLIDE (10) TO LEFT, WHICH WILL LIMIT CHARACTER RACK FOR SUB-TOTAL CHARACTER. SUBTRACT BAIL (11) ALSO RELEASED ACCUMULATOR ACTUATOR HOOK LATCH (12) TO LATCH ACCUMULATOR SECTION ACTUATOR HOOK (13). ON THIS STROKE, ACCUMULATOR WHEEL SECTION WILL ROTATE TO SUBTRACT POSITION ON FIRST PORTION OF MAINSHAFT OPERATION, ACCUMULATOR SECTION WILL ENGAGE WITH TRANSFER RACKS DURING THIS TIME AND REMAIN ENGAGED ON THE SECOND HALF OF CYCLE TO RETAIN TOTAL IN ACCUMULATOR SECTION.

XXII. UNITS REMOVAL

22.1 TOP PLATE ASSEMBLY

TO REMOVE, FOLLOW THIS SEQUENCE (REFER TO PLATE 20).

A. DISCONNECT SPRING. REMOVE STRING ASSEMBLY.
B. REMOVE KEEPER AND REMOVE NON-PRINT LINK ACTUATING FINGER (125) AND NON-PRINT LINK (120). (DO NOT REMOVE ECCENTRIC SCREW AND NUT HOLDING THESE TWO PARTS TOGETHER.)
C. REMOVE TWO SPRINGS (LEFT).
D. DISCONNECT LOWER END OF SPRING FROM STUD ON M & D ARM LOCATING PLATE (1) (PLATE 13.1).
E. DISCONNECT LEFT END OF SPRING FROM STUD ON LIST UNIT RESET SEGMENT ON TOP PLATE (PLATE 20). NOTE: RIGHT END IS HELD BY GROOVED PIN.
F. DISCONNECT TOP END OF SPRING FROM TOP PLATE.
G. REMOVE SPRING TO DIVISOR LOCATOR ARM (11).
H. REMOVE KEEPER. REMOVE DIVISOR LOCATOR SHAFT (10). AS SHAFT IS PULLED OUT TO LEFT, REMOVE DIVISOR LOCATOR ARM (11), DIVISOR LOCATOR SHAFT ROTATING ARM (9), AND DIVISOR LOCATOR SHAFT CONTROL LATCH (8) (PLATE 14).
J. REMOVE TWO SCREWS, AND TWO PLATES (PLATE 20).
K. REMOVE SCREW.
L. REMOVE FLAT HEAD SCREW.
M. REMOVE FLAT HEAD SCREW.
N. REMOVE SCREW.
P. REMOVE SCREW.
Q. REMOVE TAPERED PIN.
R. REMOVE TWO SCREWS, AND DIVISOR LOCATOR PLATE (14).
S. PULL TOP PLATE ASSEMBLY OFF MACHINE. NOTE: ESCAPEMENT RACK RESET GEAR (12) (PLATE 3) MUST REMAIN ENGAGED WITH ESCAPEMENT RACK (8) AND LIST UNIT RESET SEGMENT ON TOP PLATE (6) TO PREVENT LOSS OF ADJUSTMENT. ALSO, CHECK MESH OF LIST UNIT RESET SEGMENT ON TOP PLATE (6) TO LIST UNIT RESET SEGMENT (5). FIRST TOOTH OF TOP PLATE SEGMENT (6) SHOULD BE TO FRONT OF TOOTH ON SEGMENT (5).
T. REMOVE MULTIPLY COUNTER CONNECTOR PLATE (2) (PLATE 20).

TO REASSEMBLE, REVERSE PROCEDURE.

22.2 LIST UNIT ASSEMBLY

TO REMOVE, FOLLOW THIS SEQUENCE (REFER TO PLATE 21).

A. DISCONNECT SPRING AT BOTTOM END.
B. DISCONNECT SPRING AT FRONT END.
C. DISCONNECT SPRING AT FRONT END.
D. REMOVE KEEPER.
E. REMOVE THREE SCREWS. REMOVE LIST UNIT SUPPORT PLATE (1).
F. REMOVE LIST UNIT UPPER LOCK PLATE (27). NOTE: HALF STEP YOKE LIMIT LINK (74) (PLATE 8.4) WILL DROP DOWN AS THE LOCK PLATE (27) IS REMOVED. ALSO, REAR EXTENSION OF ACCUMULATOR ACTUATOR HOOK CONTROL SLIDE (82) (PLATE 13.3) MAY SWING DOWN. CAREFULLY PULL LIST UNIT OUT TO THE RIGHT. INTERFERENCE WILL NE CAUSED BY THE MULTIPLY COUNTER CONNECTOR PLATE (2) (PLATE 21) AND BY THE MULTIPLY COUNTER CONNECTOR (7) LIMITING ON THE LONG TOOTH (LEFT END) OF MULT COUNTER CONNECTOR RACK (54). THE LIST UNIT CAN BE REMOVED BY JIGGLING THE UNIT PAST THE INTERFERING PARTS. IT MAY BE HELPFUL TO RELEASE MULTIPLY COUNTER HOOK (6), AND SLIDE MULTIPLY COUNTER ASSEMBLY TO THE LEFT. (IF TOP PLATE HAS BEEN REMOVED BEFORE LIST UNIT, THE MULTIPLY COUNTER CONNECTOR PLATE (2) WILL NOT BE THERE TO INTERFERE AND THE LIST UNIT WILL BE EASIER TO REMOVE AND RE-ASSEMBLE.)

REVERSE PROCEDURE TO RE-ASSEMBLE.

22.3 ACCUMULATOR UNIT

TO REMOVE, PLACE MACHINE UPSIDE DOWN AND FOLLOW THIS SEQUENCE (REFER TO PLATE 22):

A. DISCONNECT REAR END OF SPRING.
B. DISCONNECT SPRING FROM CENTER FRAME STUD.
C. REMOVE KEEPER.
D. REMOVE KEEPER.
E. REMOVE KEEPER.
F. LOOSEN SCREW. BACK IT OUT ABOUT THREE TURNS.
G. REMOVE NUT AND WASHER.
H. BACK SCREW OUT ABOUT THREE TURNS.
J. REMOVE ACCUMULATOR ACTUATOR SHAFT ASSEMBLY (9649), DISENGAGING LINKAGE TO STUDS. NOTE: IN RE-ASSEMBLY, MAKE SURE STUD ENGAGES IN FORK AT "J".
K. REMOVE SHIM.
L. REMOVE CONNECTOR LINK. IN RE-ASSEMBLY, MAKE SURE LINK STUD IS ENGAGED IN WHEEL SECTION ACTUATING ARM (9007) (PLATE 8).
M. REMOVE TWO SCREWS (PLATE 22). (CAN BE REACHED THROUGH THE CAMS. REMOVE SPACER (2106) INSIDE RIGHT CENTER FRAME. RELEASE BEARING PLATE (2074) FROM STUD INSIDE RIGHT CENTER FRAME. REMOVE ACCUMULATOR CAREFULLY. LOCK BAIL RELEASE ARM (2052) IS LOOSELY MOUNTED ON LEFT SIDE OF ACCUMULATOR BODY.) IN RE-ASSEMBLY, MAKE SURE THIS PART IS PLACED ON ACCUMULATOR.

INSTALLATION OF ACCUMULATOR

1. CHECK MAIN SHAFT FOR NORMAL.
2. RELEASE ACTUATOR LINKS.
3. RESTORE ACTUATOR LATCHES.
4. CHECK CARRY CAM TO BE IN DETENTED POSITION.
5. TURN GEAR (3026) CLOCKWISE UNTIL STOPPED BY MATING PART.
6. INSTALL ACCUMULATOR IN MACHINE BY REVERSING THE PROCEDURE "M" ABOVE. WHEN MOUNTING SPACER (2106), MAKE SURE THAT THE HALF-PIERCE IN (2106) IS LOCATED PROPERLY IN HOLE IN THE RIGHT CENTER FRAME.
7. CHECK GEAR (3026) FOR PROPER POSITION AS FOLLOWS:
   PUSH AND HOLD ACCUMULATOR IN MESH MANUALLY AND CYCLE MACHINE ONCE. WITH A SPRING HOOK, PULL THE FIRST ACTUATOR LINK (8001).
   IF LINK (8001) CANNOT BE PULLED INTO CARRY POSITION, THEN GEAR (3026) IS INCORRECTLY POSITIONED AND ACCUMULATOR MUST BE REMOVED. (IF GEAR (3026) IS IMPROPERLY POSITIONED, A BIND WILL BE PERCEPTIBLE SHORTLY BEFORE MAIN SHAFT REACHES HOME POSITION.)
8. CONTINUE THE REASSEMBLY BY REVERSING THE ABOVE PROCEDURE "L" TO "A".
   NOTE: AFTER ACCUMULATOR IS COMPLETELY INSTALLED, TAKE THE FOLLOWING STEPS:
   A) CHECK ACCUMULATOR ENGAGEMENT.
   B) ENTER 6 INTO KEYBOARD AND ADD TWICE MANUALLY. (THIS WILL DRIVE READ OUT KEY (3037) HOME IF PREVIOUSLY OUT OF POSITION.)
   C) CHECK ALL ACCUMULATOR ADJUSTMENTS.

22.4 MULTIPLY COUNTER

TO REMOVE, REMOVE TOP PLATE ASSEMBLY (SECTION 22.1) AND FOLLOW THIS SEQUENCE (REFER TO PLATE 23).

A. DRIVE OUT HOLLOW PIN.
B. REMOVE GEAR.
C. DISCONNECT LEFT END OF SPRING.
D. DISCONNECT TOP END OF SPRING.
E. REMOVE SCREW. PULL BRACKET TO LEFT AND FORWARD TO RELEASE MULTIPLY COUNTER SHAFT (20).
F. PUSH SHAFT TO LEFT UNTIL IT LIMITS ON LEFT SIDE FRAME.
G. REMOVE MULTIPLY COUNTER ASSEMBLY CAREFULLY.

TO RE-ASSEMBLE, REVERSE PROCEDURE.

22.5 MULTIPLY UNIT

TO REMOVE MULTIPLY UNIT, FIRST REMOVE TOP PLATE (SECTION 22.1), LIST UNIT (SECTION 22.2), AND MULTIPLY COUNTER (SECTION 22.4) AND FOLLOW THIS SEQUENCE (REFER TO PLATE 24.)

A. DRIVE OUT TWO PINS.
B. LIFT UP CONTROL BAR.
C. REMOVE LATCH AND ITS SPRING.
D. REMOVE RACK BLADE.
E. REMOVE KEEPER.
F. REMOVE THREE LINKS AND THREE GEARS ON LEFT SIDE FRAME TO LOCATE WORK HOLE IN LEFT SIDE FRAME. TURN MAINSHAFT.
G. REMOVE TWO SCREWS AND BEARING PLATE. (TURN MAINSHAFT.)
H. REMOVE TWO SCREWS AND BEARING PLATE. NOTE: BOTTOM SCREW HAS THINNER HEAD.
J. DISENGAGE LINK STUD FROM MULTIPLY UNIT ARM BY FORCING LINK OUT OF ENGAGEMENT WITH A SCREW DRIVER. REMOVE MULTIPLY UNIT TO FRONT AND OUT OF RIGHT SIDE. (NOTE POSITION OF MULTIPLY UNIT DRIVE GEAR.)

TO RE-ASSEMBLY, REVERSE THIS PROCEDURE.

22.6 RECALL UNIT

TO REMOVE RECALL UNIT, FIRST REMOVE ACCUMULATOR (SECTION 22.3) AND FOLLOW THIS SEQUENCE (REFER TO PLATE 25).

A. TURN MACHINE UPSIDE DOWN, REMOVE SPRING.
B. REMOVE THREE SCREWS (SPRING CLIPS UNDER RIGHT AND LEFT SCREWS).
C. REMOVE FRONT BOTTOM PLATE.
D. REMOVE KEEPER (AT REAR OF LINK (26) DISCONNECT LINK FROM STUD ON RACK RESET BELLCRANK (27).
E. LOOSEN SET COLLAR.
F. REMOVE SCREW, DISENGAGE BEARING PLATE FROM LEFT CENTER FRAME.
G. REMOVE SCREW, DISENGAGE BEARING PLATE FROM RIGHT CENTER FRAME. REMOVE RACK RESET SHAFT ASSEMBLY (24) CAREFULLY BY-PASSING ARM OF ASSEMBLY (41) (PLATE 7.2).
H. REMOVE KEEPER (PLATE 25).
J. BACK OUT BEARING.
K. REMOVE KEEPER.
L. LOOSEN ARM AND SWING IT OUT OF THE WAY.
M. PUSH RECALL UNIT TO RIGHT SIDE OF MACHINE TO DISENGAGE UNIT FROM BEARING IN LEFT CENTER FRAME. REMOVE UNIT.

22.7 KEYBOARD

TO REMOVE KEYBOARD, REMOVE TOP PLATE (SECTION 22.1) AND LIST UNIT (SECTION 22.2) AND FOLLOW THIS SEQUENCE (REFER TO PLATES 26 AND 27).

REFER TO PLATE 26

A. REMOVE NUT AND WASHER.
B. REMOVE KEEPER.
C. REMOVE KEEPER AND SPACERS
D. REMOVE THREE LINKS.
E. REMOVE KEEPER AND GEAR ASSEMBLY.
F. REMOVE KEEPER AND GEAR.
G. DISCONNECT TOP END OF SPRING.
H. REMOVE KEEPER.
J. REMOVE LINK.
K. DISCONNECT SPRING ANCHOR.
L. REMOVE KEEPER AND TAKE BELLCRANK OFF STUD.
M. REMOVE HEX SCREW STUD.
N. REMOVE TWO KEYBOARD MOUNTING SCREWS, LEFT
P. REMOVE KEEPER, DISCONNECT LINK FROM STUD.
Q. REMOVE KEEPER, DISCONNECT LINK FROM STUD.
R. REMOVE TWO SPRINGS.
S. REMOVE KEEPER, DISCONNECT SLIDE FROM SLOT OF KEYBOARD SLIDE.
T. REMOVE SPRING.

REFER TO PLATE 27

A. DISCONNECT ARM FROM YOKE.
B. DISCONNECT REAR END OF SPRING.
C. DISCONNECT TOP END OF SPRING.
D. DISCONNECT TOP END OF SPRING.
E. REMOVE TWO SCREWS AND SPRING CLIP.
F. REMOVE TWO SCREWS. REMOVE EXTENSION.
G. DISCONNECT BOTTOM END OF SPRING.
H. REMOVE TWO SCREWS.
J. REMOVE KEEPER, REMOVE ARM.
K. DISCONNECT TOP END OF SPRING.
L. REMOVE TWO KEEPERS, REMOVE LINK.
M. REMOVE TWO KEEPERS, REMOVE LINK.
N. REMOVE SPRING.
P. REMOVE KEEPER.
Q. REMOVE LINK.
R. REMOVE SCREW, REMOVE PLATE.
S. REMOVE SCREW.
T. REMOVE KEEPER, DISCONNECT LINK.
U. REMOVE SCREW WITHIN KEYBOARD.
V. DISCONNECT REAR END OF LINK, REMOVE KEYBOARD CAREFULLY, NOTING HOW LINKAGE IS HOOKED UNDER KEYBOARD SO THAT RE-ASSEMBLY CAN BE DONE CORRECTLY.

22.8 TYPE ARM REPLACEMENT PROCEDURE

1. REMOVE TOP PLATE ASSEMBLY (AS OUTLINED ON PAGE 73 AND PLATE 20 OF DM-228).

2. REMOVE RIBBON AND SPOOLS.

3. REMOVE RIBBON LIFTING ASSEMBLY (20)(PLATE 10) BY REMOVING TWO PINS AND UNHOOKING SPRING FROM LIFT ARM (19).

4. REMOVE RIGHT RIBBON BRACKET AND CONTROL SHAFTS (2) AND (5). THIS IS ACCOMPLISHED BY REMOVING TWO SCREWS IN BACK PLATE FOR RIBBON BRACKET AND TWO KEEPERS FROM LOWER END OF SHAFTS (2) AND (5).

5. REMOVE HIGH SPEED ACTUATOR BELLCRANK (97)(PLATE 13.4) (1 KEEPER, 1 SPRING).

6. REMOVE RIGHT RIBBON POST BRACKET AND CARRIAGE FEED BELLCRANK (9) (PLATE 11) BY REMOVING TWO SCREWS.

7. REMOVE TYPE GUIDE COMB (20) (PLATE 9) BY REMOVING KEEPER FROM LEFT PIVOT SHAFT (D) (PLATE 10) AND SLIDING SHAFT TO LEFT. REMOVE KEEPER FROM RIGHT PIVOT SHAFT AND SLIDE SHAFT TO RIGHT.

8. REMOVE DECIMAL CONTROL SHAFT (21) (PLATE 9) BY REMOVING KEEPER FROM LEFT END OF SHAFT.

9. REMOVE KEEPER FROM FRONT END OF DIGIT KEY MOTOR TRIP LINK (15) (PLATE 4) AND LOWER FRONT END OF LINK.

10. REMOVE MOTOR ASSEMBLY COMPLETE (4 SCREWS).

11. REMOVE RIGHT ARM (9) (PLATE 9) AND SPACER FROM TYPE LATCH SHAFT (8) BY DISCONNECTING SPRING (G), REMOVING TWO PINS AND SLIDING SHAFT (8) SLIGHTLY TO LEFT.

12. DISCONNECT SPRING FROM TYPE ARM (14) TO BE REPLACED.

13. DISCONNECT SPRING FROM TYPE LATCH (12) OR (13) IN COLUMN WHERE TYPE ARM (14) IS TO BE REPLACED.

14. REMOVE LOWER REAR SUPPORT SHAFT FOR TYPE ARM SUPPORT BRACKET (7) BY DISCONNECTING SPRING FROM MULT GEAR HOOK CONTROL ACTUATOR (31) (PLATE 12.1) AND REMOVING TWO KEEPERS FROM SHAFT INSIDE RIGHT AND LEFT CENTER FRAMES. SLIDE SHAFT TO RIGHT UNTIL DESIRED TYPE ARM (14) (PLATE 9) IS FREE FOR REMOVAL.

    NOTE: NO FOLLOW-UP SHAFT IS NECESSARY. IN RE-ASSEMBLY, BE SURE TO RE-INSTALL CONTROL ACTUATOR (31) (PLATE 12.1).

15. MOVE TYPE LATCH SHAFT (8) (PLATE 9) TO RIGHT TO THE DESIRED COLUMN USING FOLLOW-UP SHAFT (ST-40707).

16. MOVE TYPE LATCH SHAFT (28-3418) (REF. PLATE 41 OF PARTS CATALOG DP-231) TO RIGHT TO THE DESIRED COLUMN, USING FOLLOW-UP SHAFT. TO ACCOMPLISH THIS, REMOVE TWO KEEPERS FROM SHAFT LOCATED ON OUTSIDE OF RIGHT AND LEFT CENTER FRAMES AND LOOSEN SET SCREW IN COLLAR LOCATED INSIDE RIGHT CENTER FRAME.

    NOTE: THE NUMBER FOR FOLLOW-UP SHAFT TO BE USED IS (28-3418). IT WILL BE NECESSARY TO GRIND ONE END OF SHAFT FOR EASIER INSERTION.

17. TYPE ARM (14) (PLATE 9) TO BE REPLACED CAN NOW BE REMOVED USING EXTREME CAUTION NOT TO LOSE SPACING LUGS LOCATED BETWEEN TYPE ARM SUPPORT BRACKETS (7).

NOTE: IN RE-ASSEMBLY, CARE SHOULD BE TAKEN TO PROPERLY POSITION SPACING LUGS AND TYPE LATCHES (12) OR (13) IN RESPECT TO THE TYPE ARMS (14). ALSO MAKE SURE PRINTING DIAL IS IN TIME BEFORE MESHING PRINTING DIAL INTERMEDIATE GEAR (5) WITH TRANSFER RACK.

18. REVERSE ABOVE PROCEDURE FOR RE-ASSEMBLY.

22.9 LIST UNIT GEAR TIMING

1. REMOVE LIST UNIT FROM MACHINE AS OUTLINED ON PAGE 74 OF INSTRUCTION MANUAL DM-228.

2. REMOVE PIN (4) AND RUBBER BUMPER (3) FROM RIGHT END OF LIST UNIT SLIDE BAR (2). (REFER TO ATTACHED PLATE 28)

3. REMOVE LIST UNIT GEAR FRAME (1) FROM LIST UNIT SLIDE BAR (2).

4. REMOVE SCREW (10), RETAINING WASHER (9) AND LIST UNIT GEAR SHAFT SUPPORT (8).

5. REMOVE LOWER LIST UNIT GEAR SHAFT (12) AND LOWER LIST UNIT GEARS (13) AND (14), NOTING THE LAST GEAR (14) ON THE LEFT HAS A SHORTER HUB.

6. REMOVE LIST UNIT GEAR LOCK (7) BY REMOVING NUT (6) AND SCREW (5).

7. CAREFULLY REPLACE UPPER SHAFT (11), SHIMS (A) AND ANY GEARS (15) AND (16) THAT MIGHT HAVE COME OFF, NOTING THE LAST GEAR (15) ON THE LEFT HAS A SHORTER HUB.

8. VIEWING RIGHT SIDE OF LIST UNIT AS INSTALLED IN MACHINE, ROTATE ALL UPPER LIST UNIT GEARS (15) AND (16) COUNTERCLOCKWISE TO LIMIT POSITION. NEXT PLACE A SMALL STRAIGHT PIECE OF METAL AGAINST THE UPPER GEARS AND LIST UNIT GEAR FRAME (1) AND RETAIN WITH RUBBER BANDS AROUND LIST UNIT GEAR FRAME (1). THIS PREVENTS UPPER GEARS FROM MOVING WHEN INSTALLING LOWER GEARS (13) AND (14). YOU MIGHT USE DECIMAL POINTER RAIL (M-58342).

9. TURN THE LIST UNIT UPSIDE DOWN AND INSTALL ALL LOWER GEARS (13) AND (14) WITH INTERNAL EARS POSITIONED AT TOP, POINTING STRAIGHT TO THE UPPER SHAFT (11).

   NOTE: AFTER ALL LOWER GEARS (13) AND (14) ARE INSTALLED MESHED WITH UPPER GEARS (15) AND (16) AND RESTING AGAINST THE SHELF OF LIST UNIT FRAME (1), NOTE THAT ALL LOWER GEARS ARE TIMED CORRECTLY BY SIGHTING ACROSS THE INTERNAL EARS THROUGH FRAME HOLES OF LIST UNIT.

10. INSERT MILLED PORTION OF LOWER LIST UNIT GEAR SHAFT (12) THROUGH THE LOWER GEARS (13) AND (14) AND FRAME HOLES. THIS PREVENTS THE LOWER GEARS FROM GETTING OUT OF TIME WITH UPPER GEARS (15) AND (16). CONTINUE TO INSERT LOWER SHAFT (12) BY ALIGNING GROOVE IN SHAFT WITH THE INTERNAL EARS OF THE LOWER GEARS. REPLACE LIST UNIT GEAR SHAFT SUPPORT (8) WITH RETAINING WASHER (9) AND SCREW (10).

11. REMOVE RETAINING PLATE FOR UPPER GEARS (15) AND (16) AND TURN EXTREME RIGHT UPPER GEAR (13) CLOCKWISE LOOKING FROM RIGHT SIDE UNTIL IT LIMITS. INSTALL LIST UNIT GEAR LOCK (7) WITH THE RIGHT UPPER GEAR (16) IN THIS POSITION.

12. AFTER ANCHORING SHAFT (12), CHECK TO SEE THAT ALL SIXTEEN LIST UNIT GEARS MOVE NINE TEETH.

13. VIEWING FROM LEFT SIDE, ROTATE LOWER SHAFT (12) CLOCKWISE UNTIL IT LIMITS, THEN HOLD LIST UNIT GEARS (15) AND (16) FROM TURNING AND ROTATE LOWER SHAFT (12) COUNTERCLOCKWISE UNTIL IT LIMITS. WITH LOWER SHAFT (12) AND GEARS (15) AND (16) IN THIS POSITION, INSTALL LIST UNIT FRAME (1) ON SLIDE BAR (2).

14. CHECK TO SEE THAT LIST UNIT DRIVE GEAR (17) MOVES NINE TEETH. (FROM ONE SIDE OF STOP ALL THE WAY TO OTHER SIDE OF STOP).

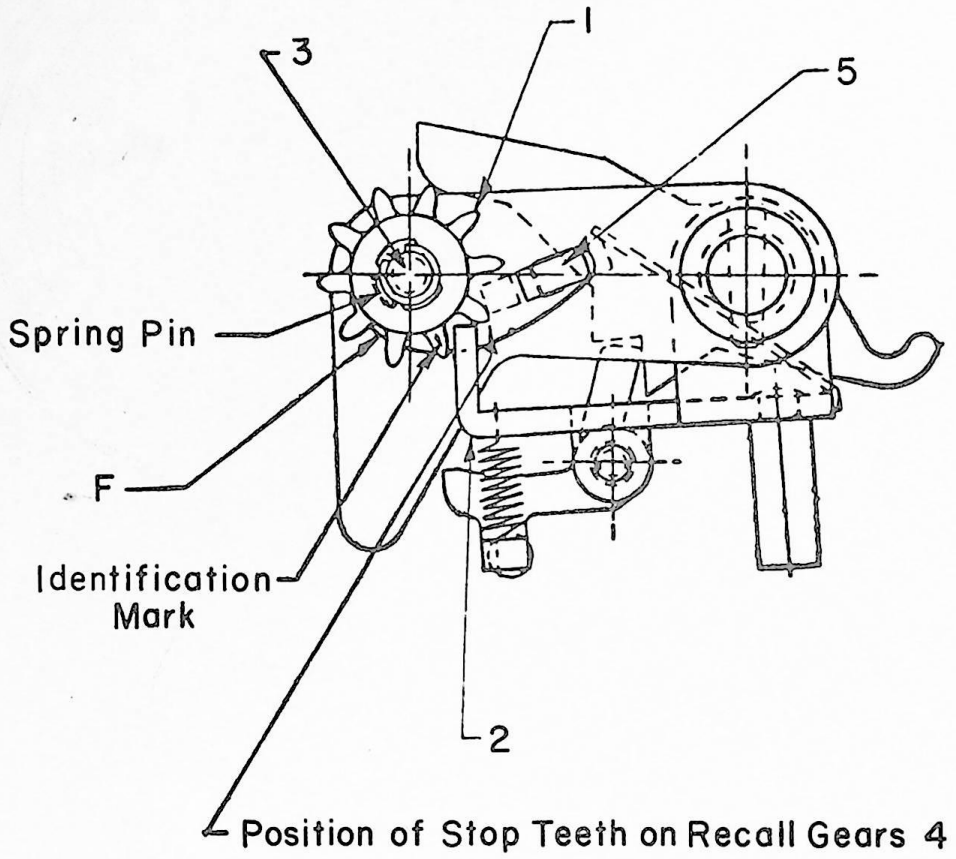
15. REPLACE RUBBER BUMPER (3) AND PIN (4).

RECALL UNIT CLOCK SPRING PRELOAD INFORMATION

WITH THE DRIVE GEAR (1) REMOVED AND THE LOCK PLATE (2) HELD OUT, TURN THE RECALL UNIT GEAR SHAFT (3) COUNTERCLOCKWISE TO BRING THE STOP TOOTH ON EACH RECALL UNIT GEAR (4) AGAINST THE RECALL GEAR LOCK BAR (5) AS INDICATED.

HOOK THE SPRING (F) TO THE PIN (IN POSITION SHOWN) IN THE COIL SPRING BUSHING ON THE END OF THE SHAFT AND PRELOAD THE SPRING BETWEEN ONE-HALF AND ONE TURN. IF THIS PRE-LOAD RANGE CANNOT BE OBTAINED WITH THE SPRING PIN LOCATED AS SHOWN, REPOSITION THE COIL SPRING BUSHING 180°.

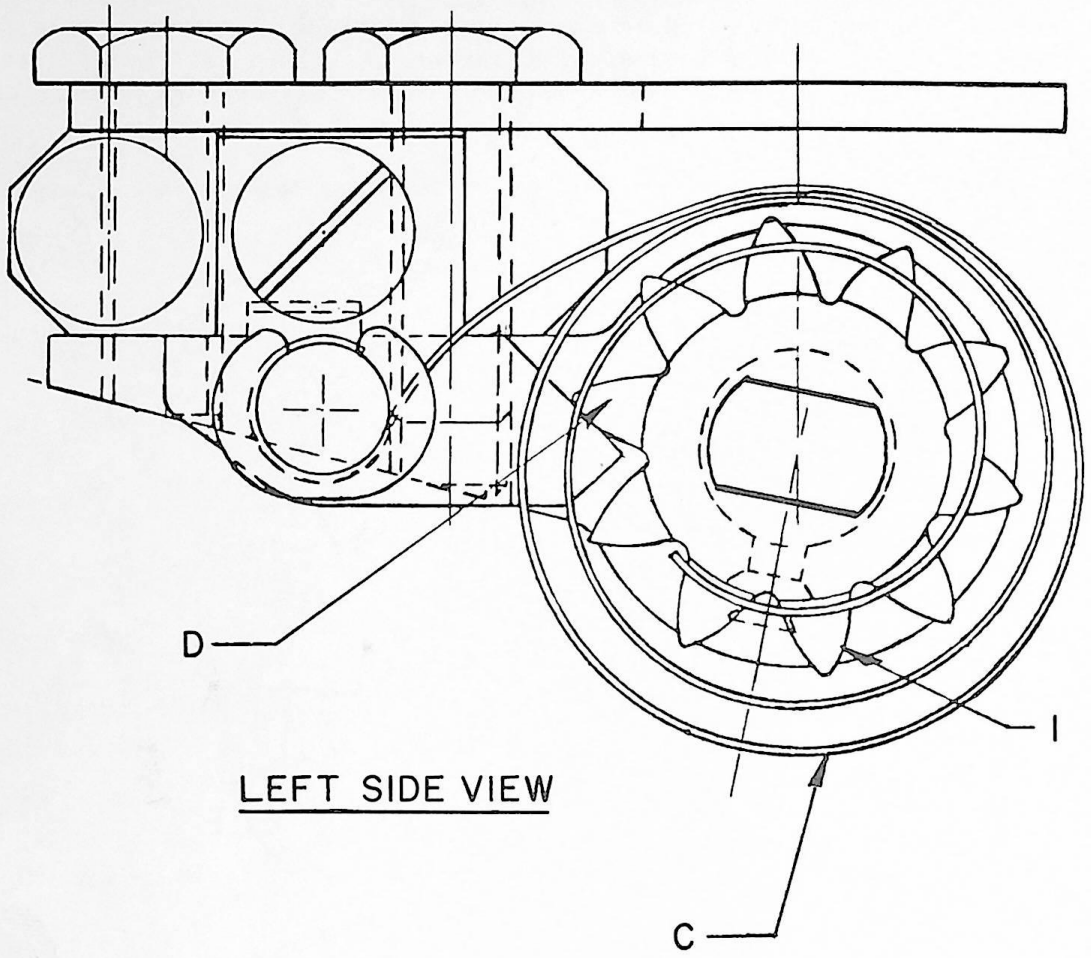
ASSEMBLY THE DRIVE GEAR (1) WITH THE IDENTIFICATION MARK IN POSITION SHOWN AND INSTALL RETAINER.



LEFT SIDE VIEW

LIST UNIT CLOCK SPRING PRELOAD INFORMATION

WITH THE STOP (WIDE) TOOTH (D) ON THE LIST UNIT DRIVE GEAR (1) IN POSITION SHOWN, PRELOAD THE SPRING (C) BETWEEN ONE AND TWO TURNS - ONE TURN PREFERRED.



LEFT SIDE VIEW

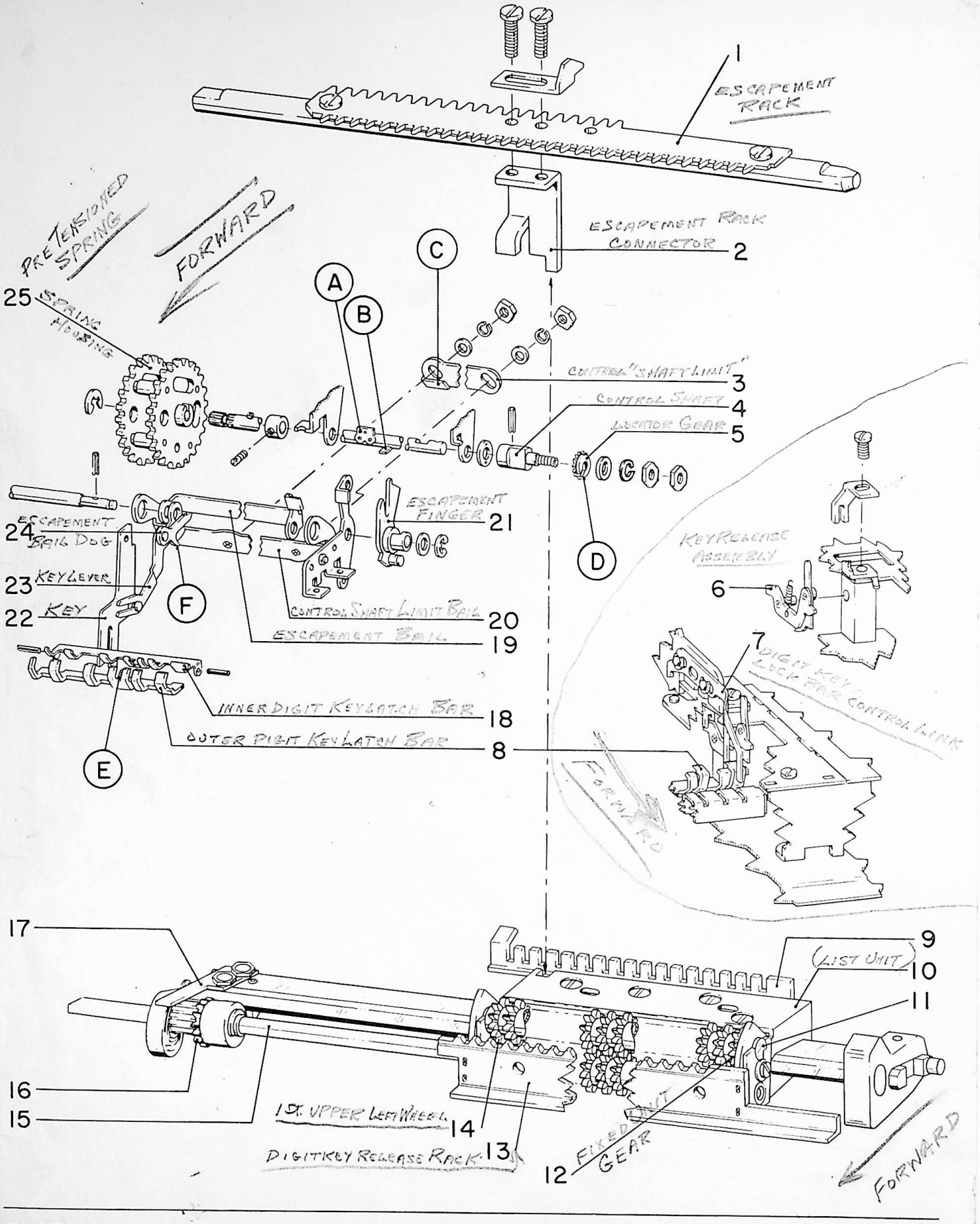


PLATE 1

DIGIT KEY OPERATION (1-9)

No Two except. (1.4 for 12)

Stop
Decimal
Storage
Mult Sub T.

Steel Ball Interlock mech.

PLATE 1.1

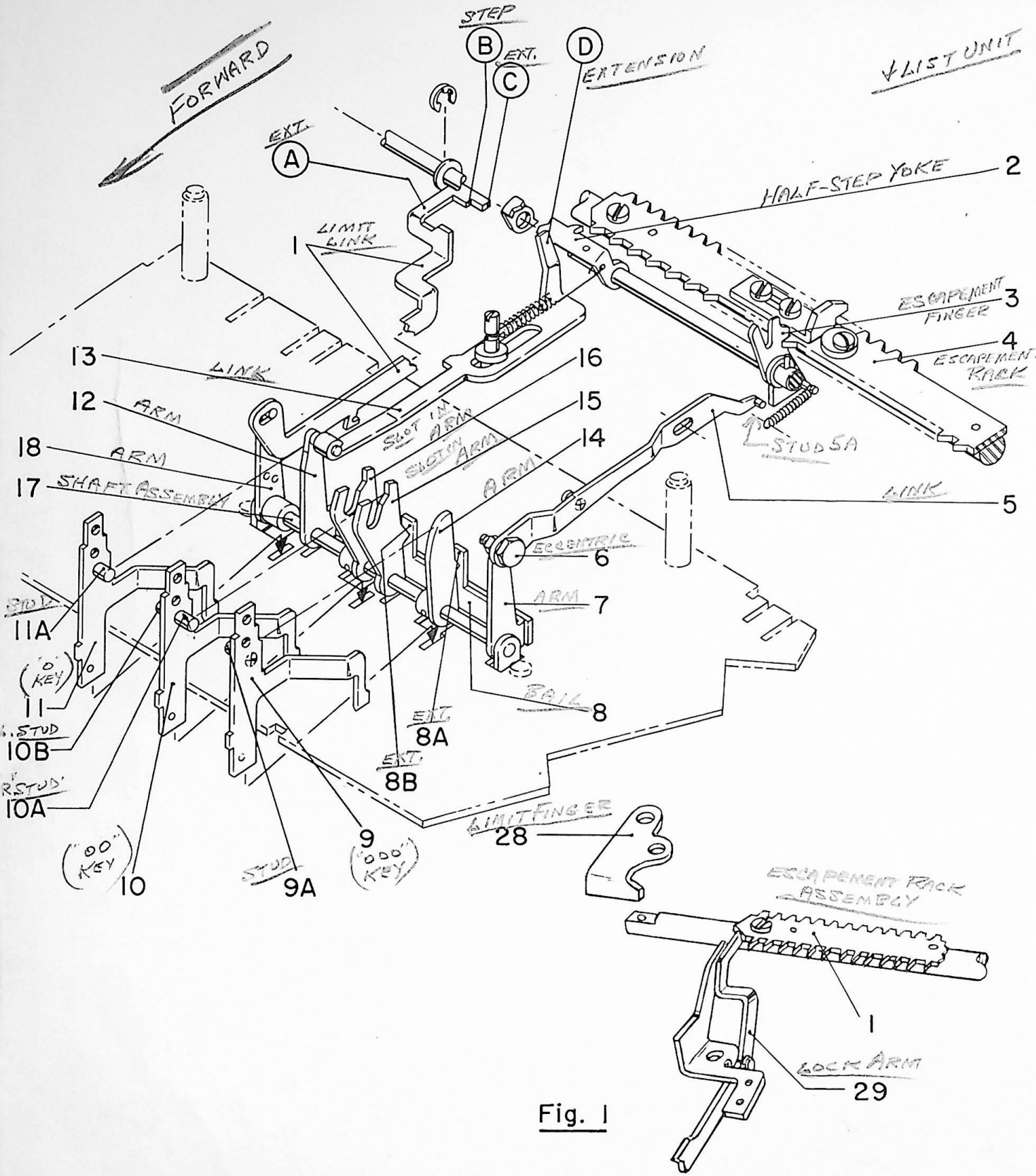
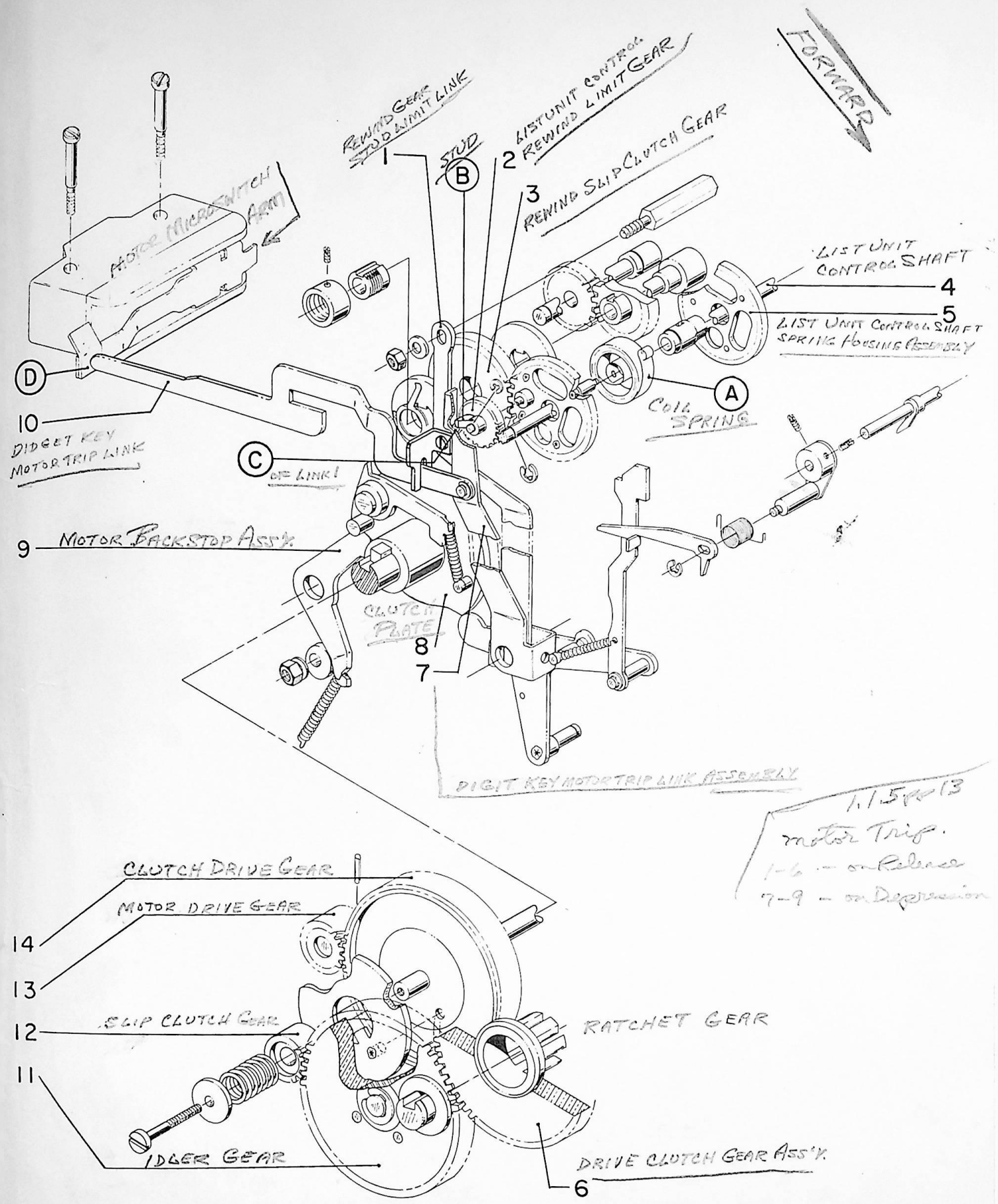
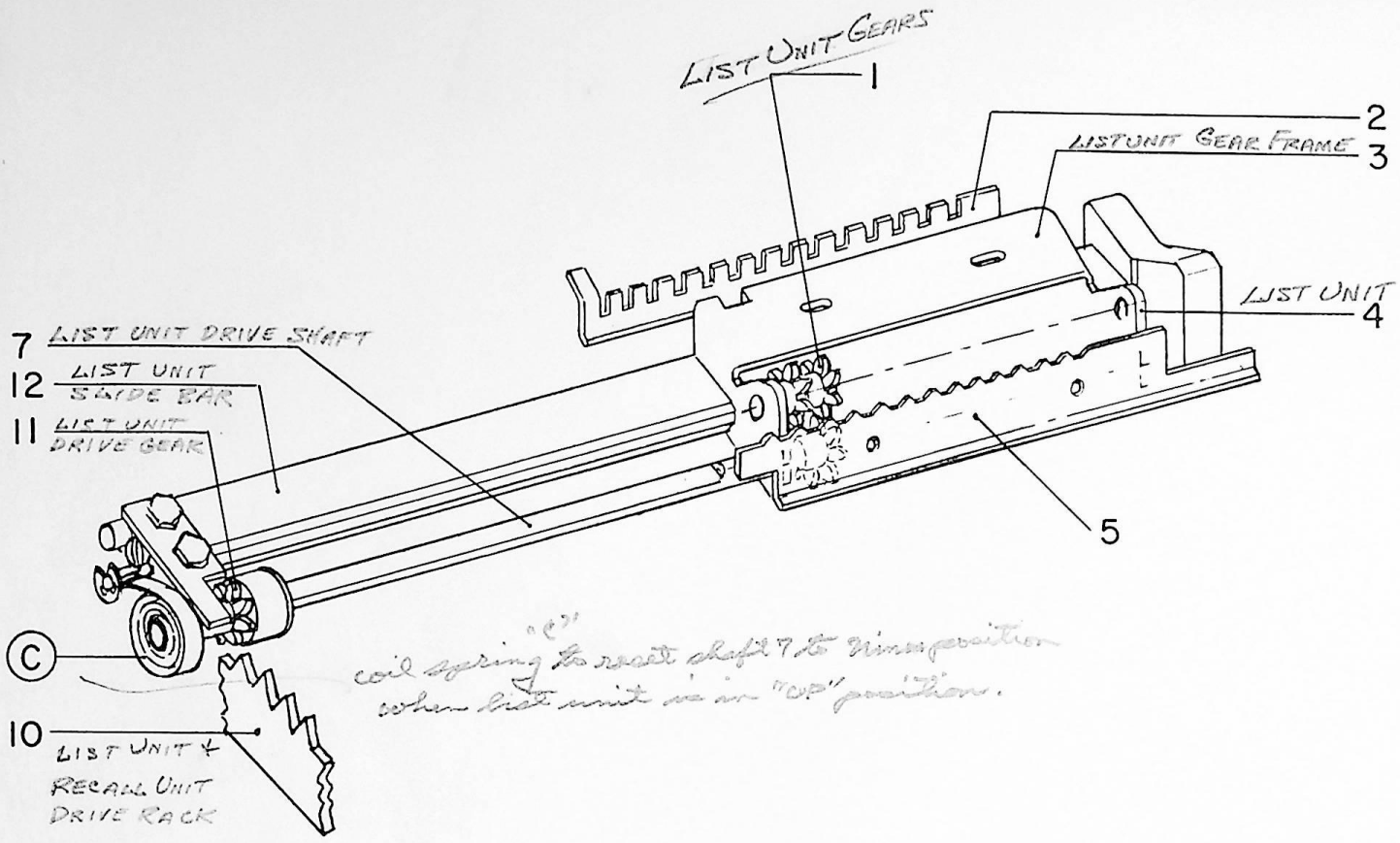

FORWARD
STEP
B
EXT.
C
D
EXTENSION
LIST UNIT
EXT.
A
HALF-STEP YOKE
2
LIMIT LINK
1
ESCAPEMENT FINGER
3
4
ESCAPEMENT RACK
13
LINK
16
12
ARM
SLOT IN ARM
15
18
ARM
ELOIN ARM
14
17
SHAFT ASSEMBLY
ARM
STUD 5A
LINK
5
ECCENTRIC
6
STUD
11A
ARM
7
("0" KEY)
11
BAIL
8
STUD
10B
EXT.
8A
STUD
10A
EXT.
8B
LIMIT FINGER
28
("00" KEY)
10
STUD
9A
9
("000" KEY)
ESCAPEMENT RACK ASSEMBLY
1
LOCK ARM
29

Fig. 1


FORWARD
REWIND GEAR STUD LIMIT LINK
1
STUD
B
2
LIST UNIT CONTROL REWIND LIMIT GEAR
3
REWIND SLIP CLUTCH GEAR
MOTOR MICRO-SWITCH ARM
LIST UNIT CONTROL SHAFT
4
5
LIST UNIT CONTROL SHAFT SPRING HOUSING ASSEMBLY
D
A
COIL SPRING
10
DIGIT KEY MOTOR TRIP LINK
C
DP LINK
9
MOTOR BACKSTOP ASS'Y.
CLUTCH PLATE
8
7
DIGIT KEY MOTOR TRIP LINK ASSEMBLY
1.1.5 & 13
motor Trip.
1-6 — on Release
7-9 — on Depression
CLUTCH DRIVE GEAR
MOTOR DRIVE GEAR
14
13
12
SLIP CLUTCH GEAR
RATCHET GEAR
11
IDLER GEAR
DRIVE CLUTCH GEAR ASS'Y.
6



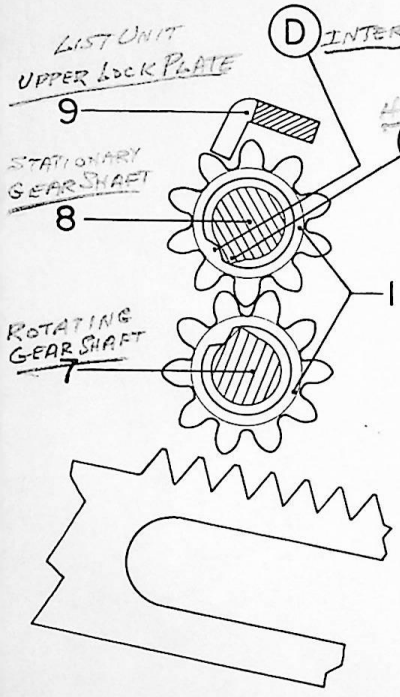


Fig. 1
NORMAL POSITION

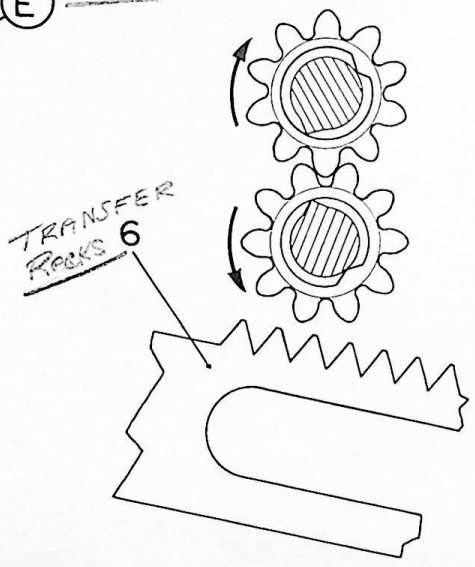


Fig. 2
INDEXED POSITION

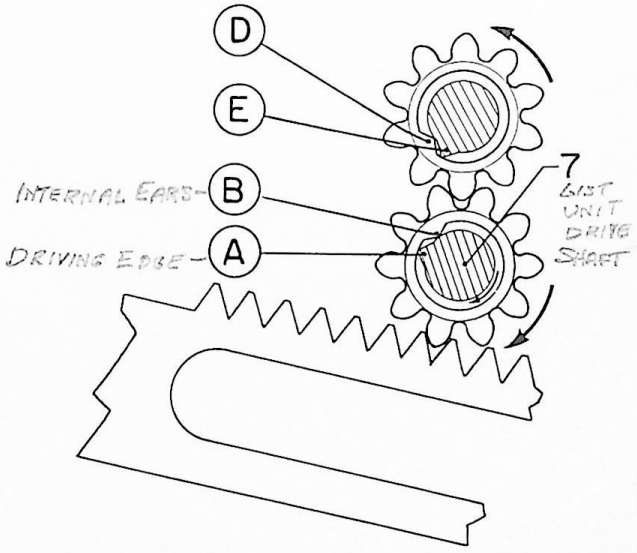


Fig. 3
DRIVING POSITION

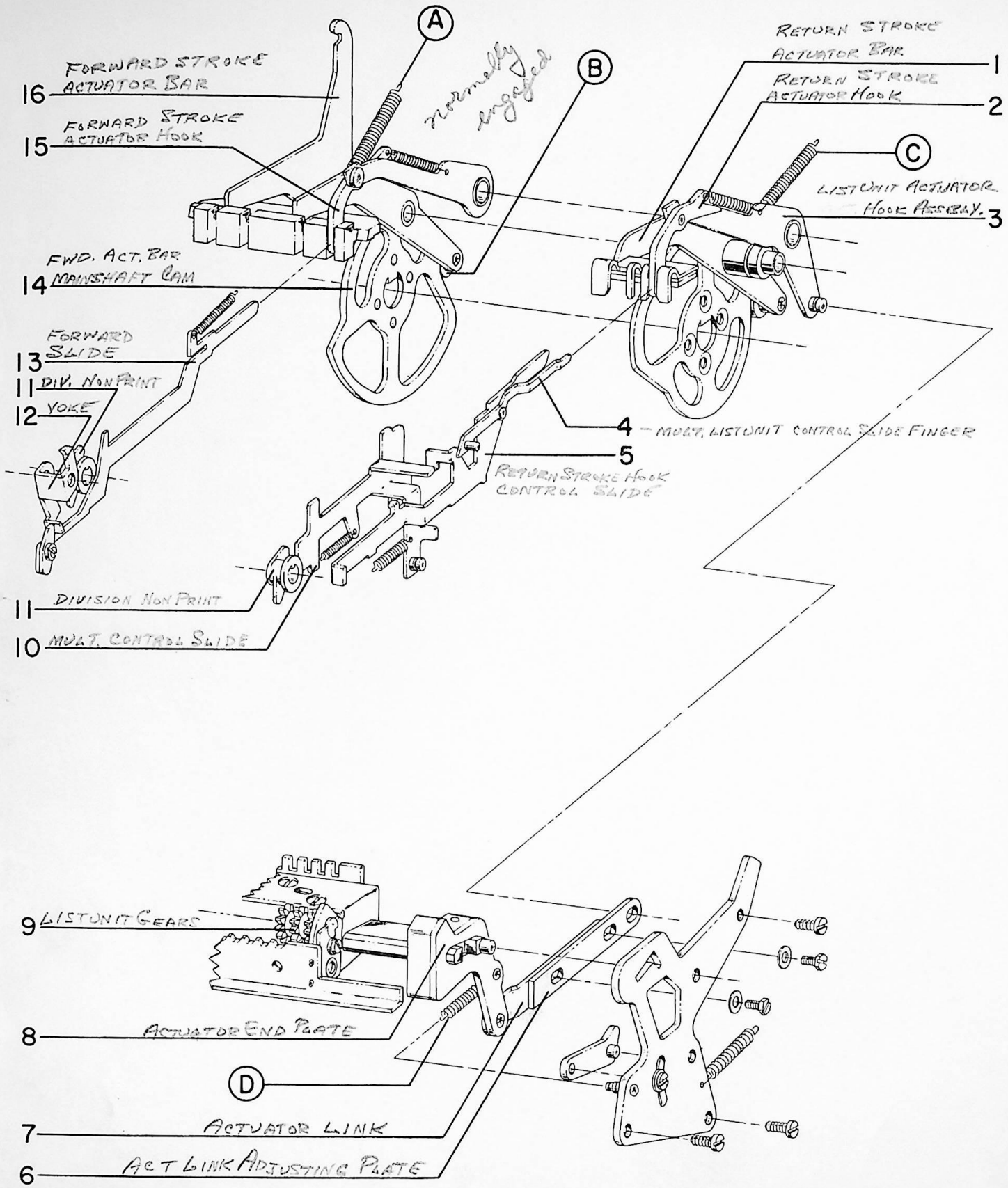
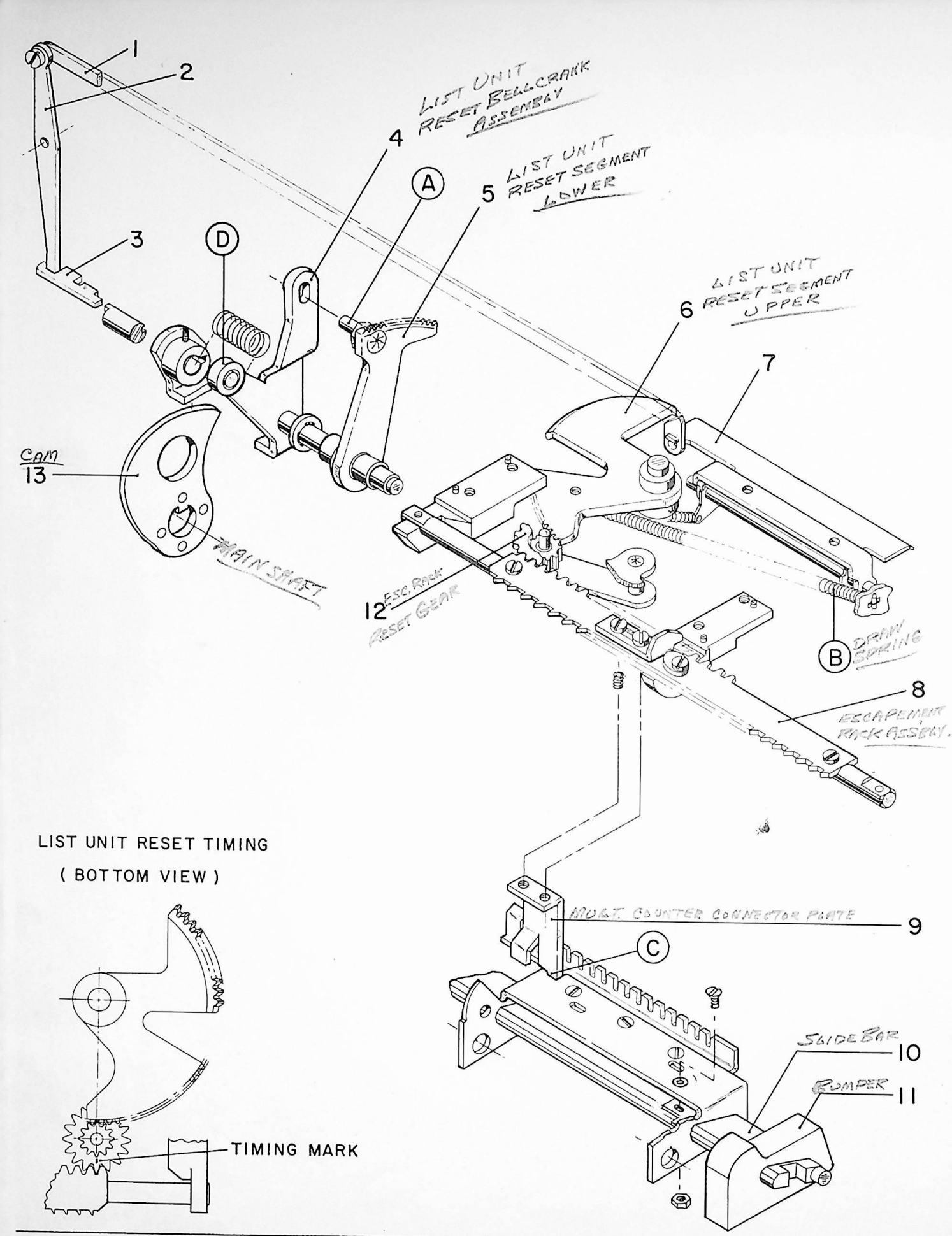


PLATE 2 LIST UNIT FORWARD and RETURN STROKE ACTUATOR HOOKS

- counter clock beginning operation

PLATE 3



LIST UNIT RESET TIMING

(BOTTOM VIEW)

PLATE 3

LIST UNIT RESET MECHANISM

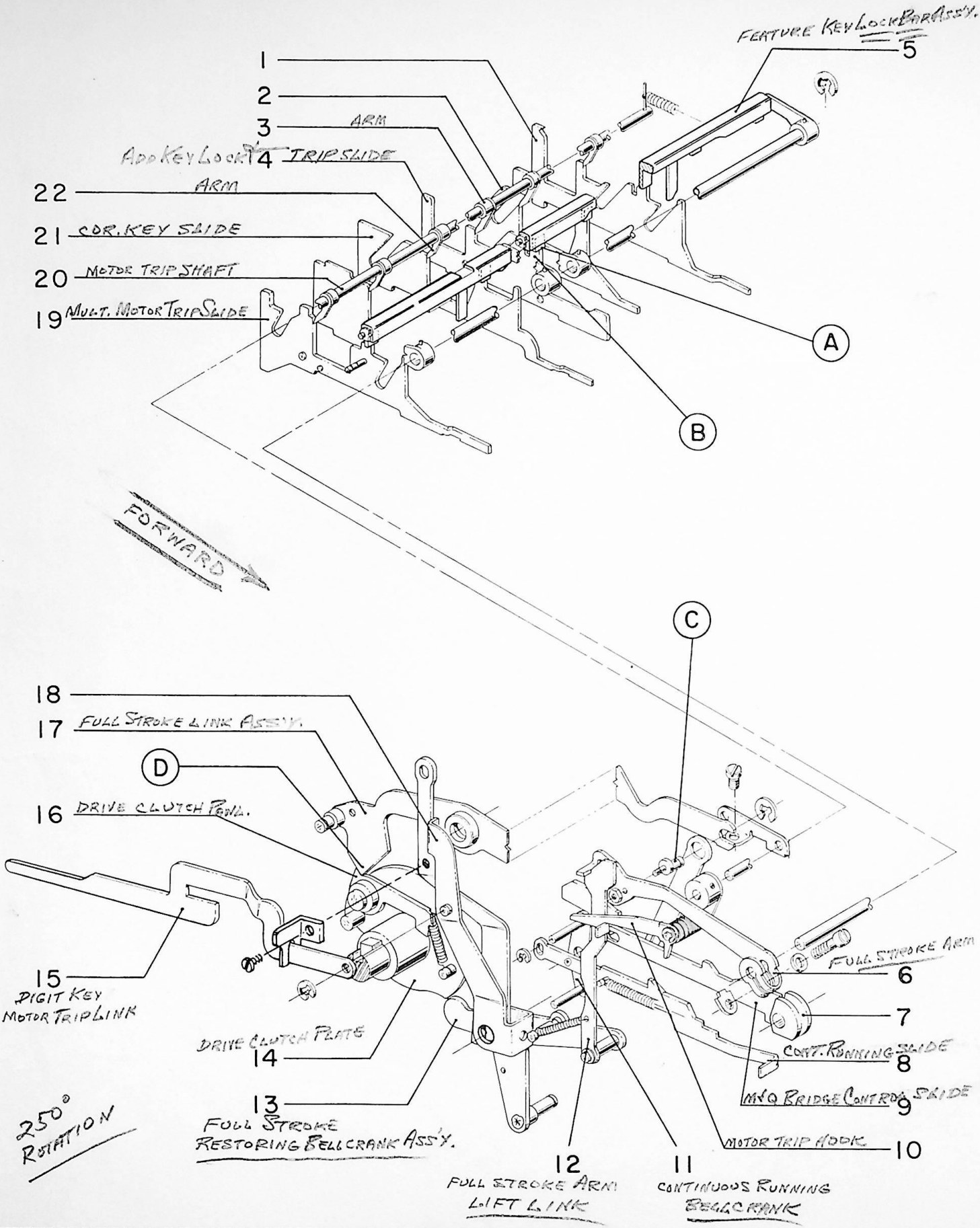
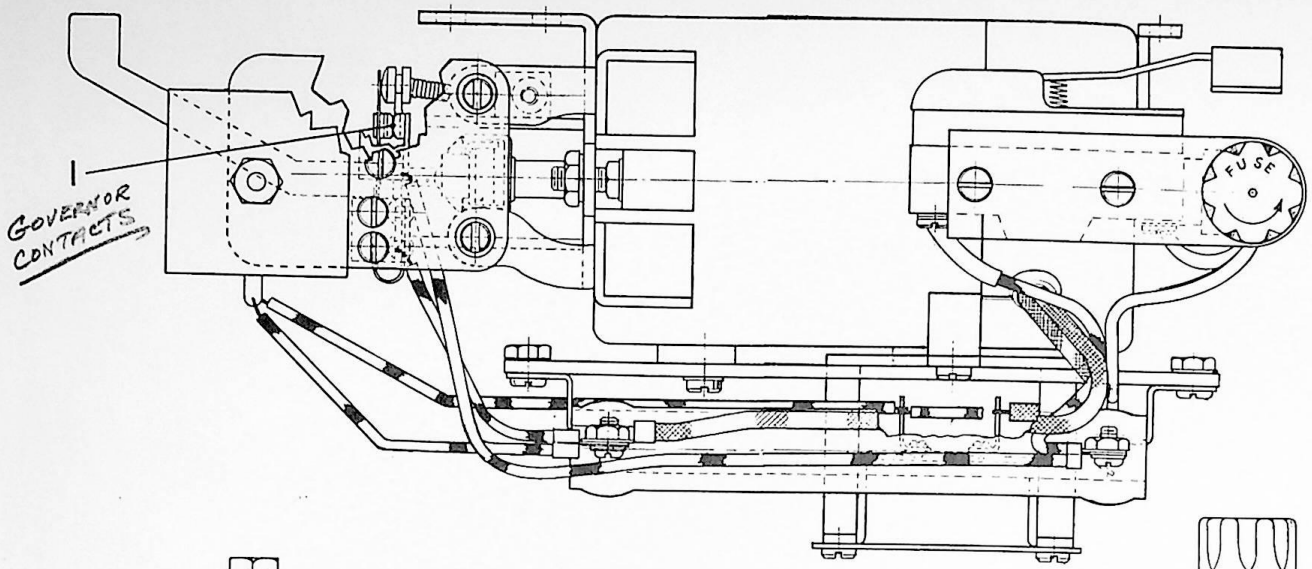
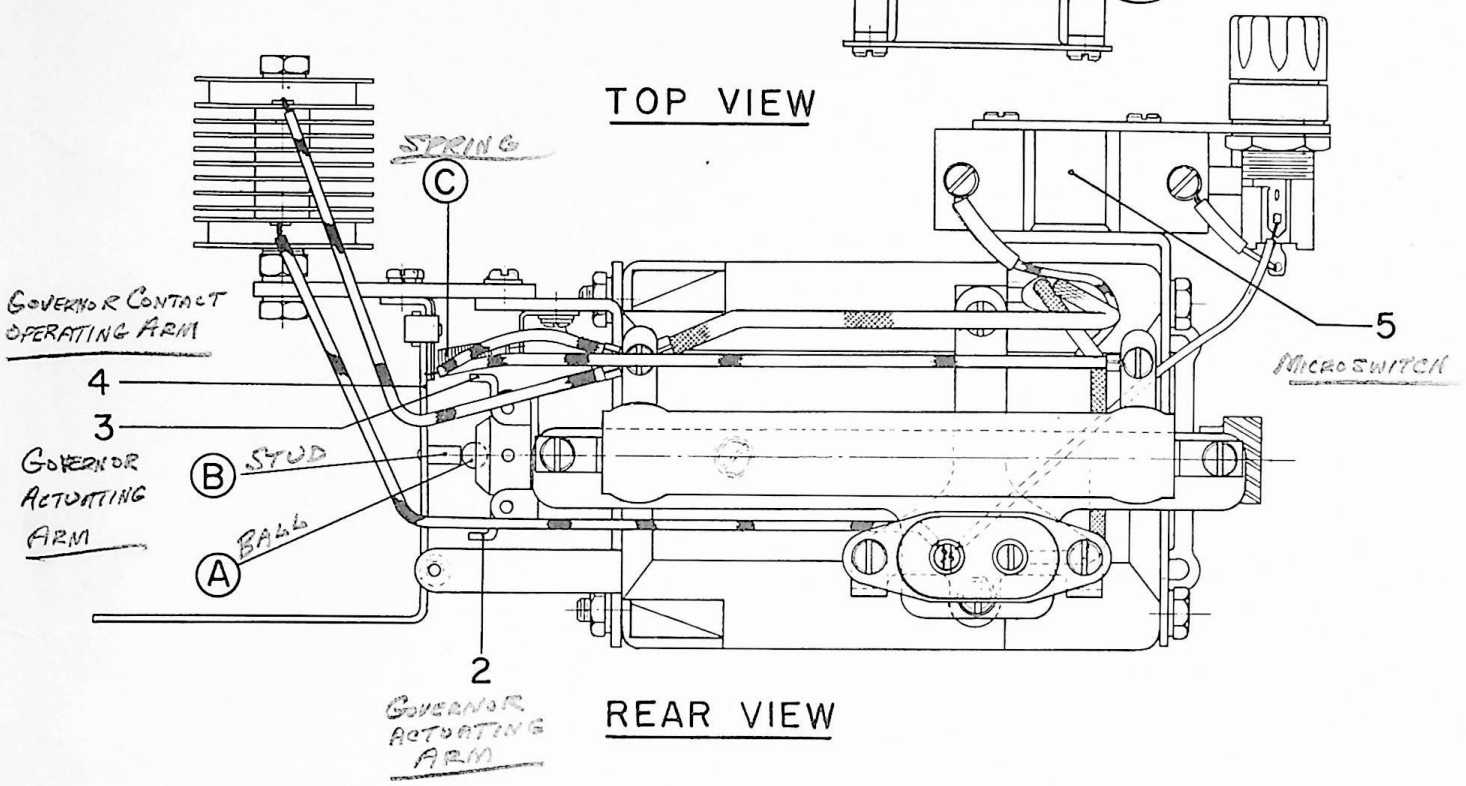


PLATE 4

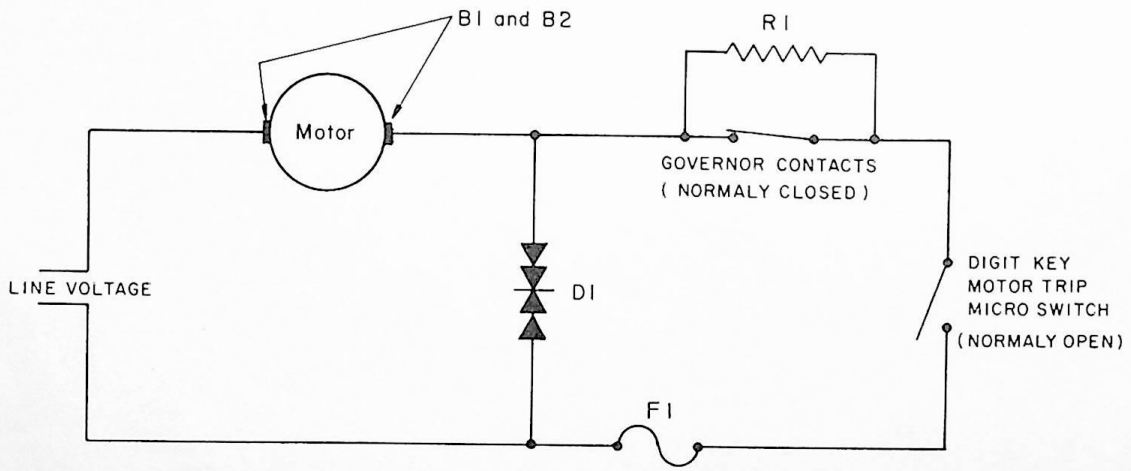
FEATURE KEY MOTOR TRIP



TOP VIEW



REAR VIEW



MOTOR WIRING DIAGRAM

PLATE 4.1 MOTOR and GOVERNOR

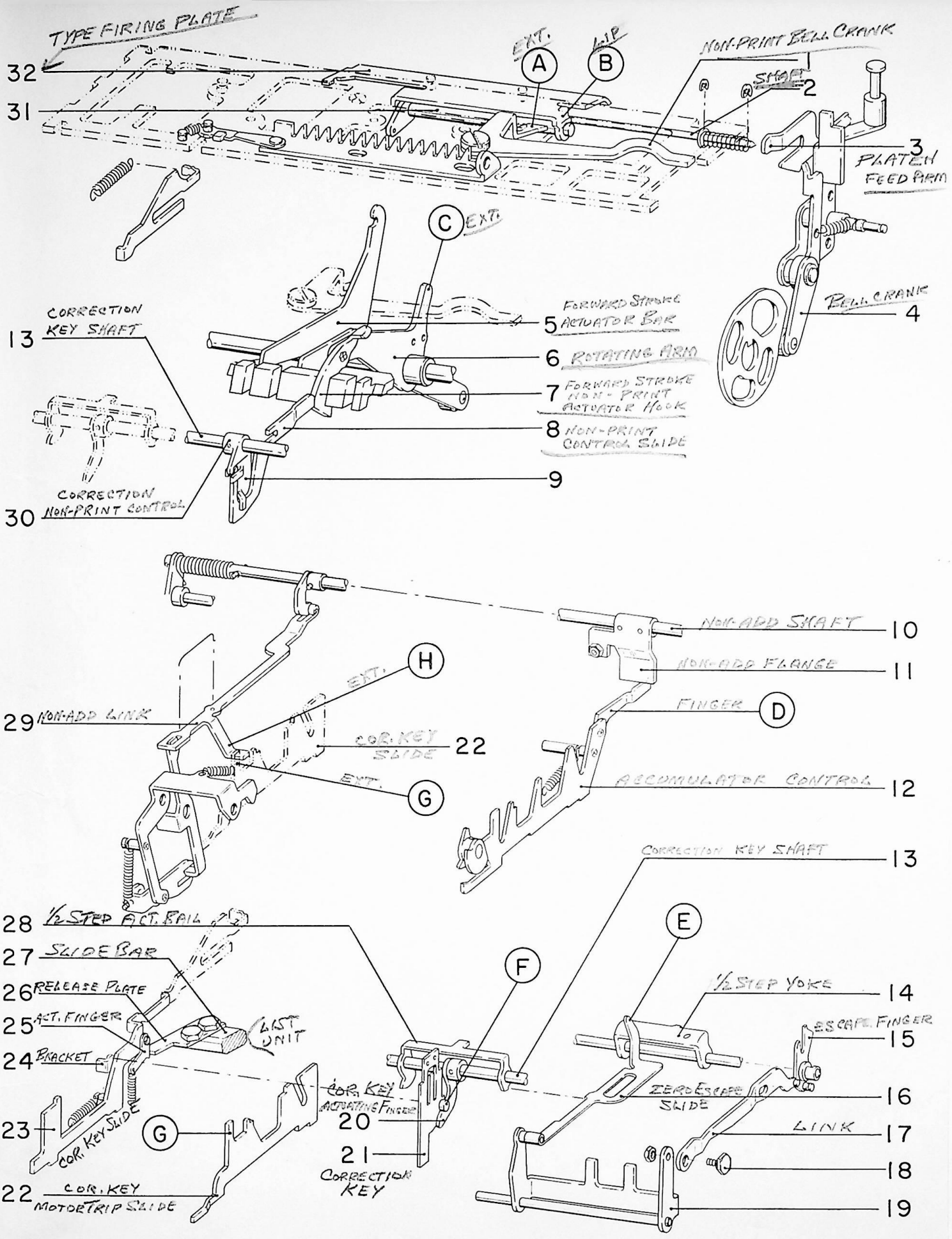


PLATE 5

CORRECTION OPERATION

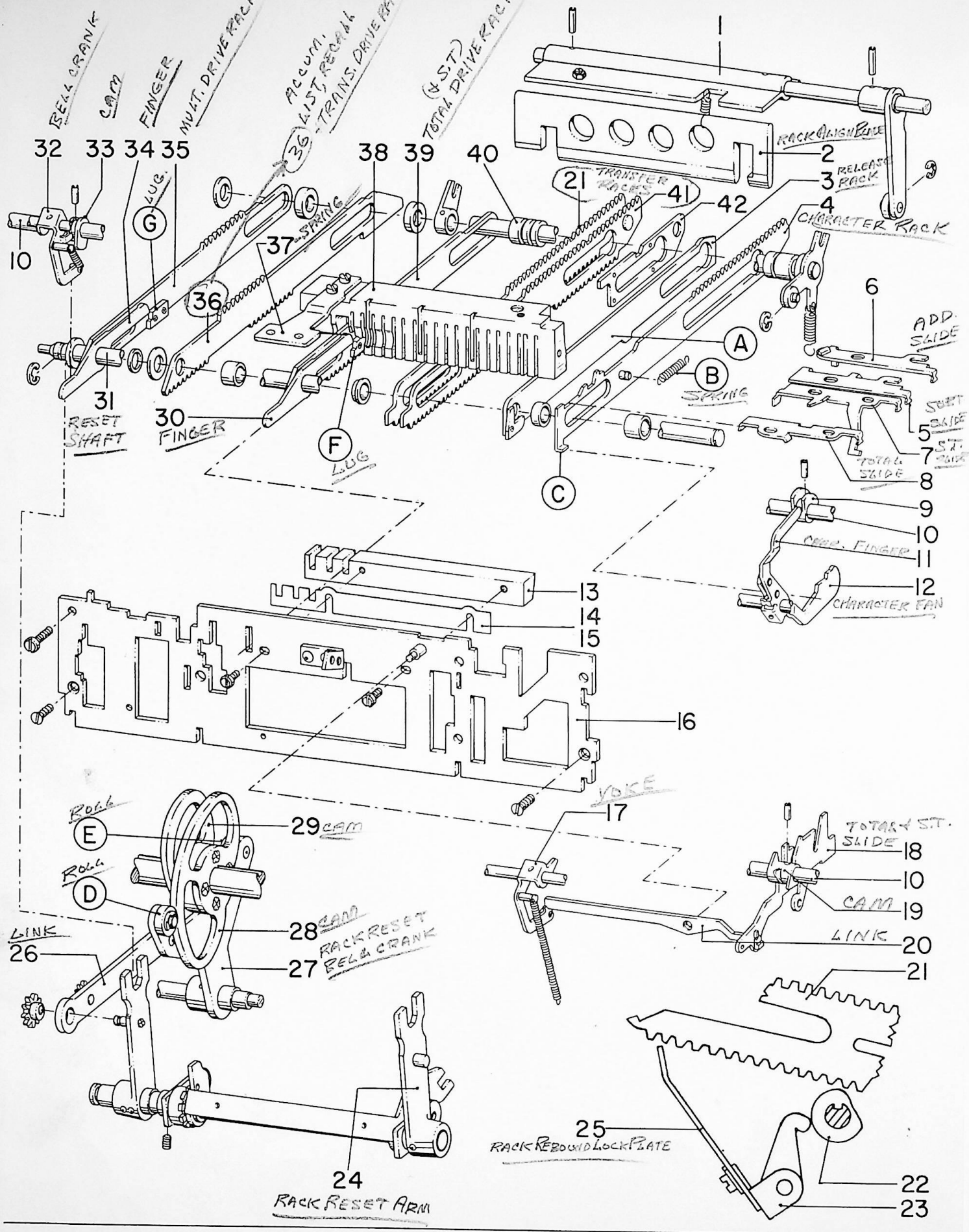
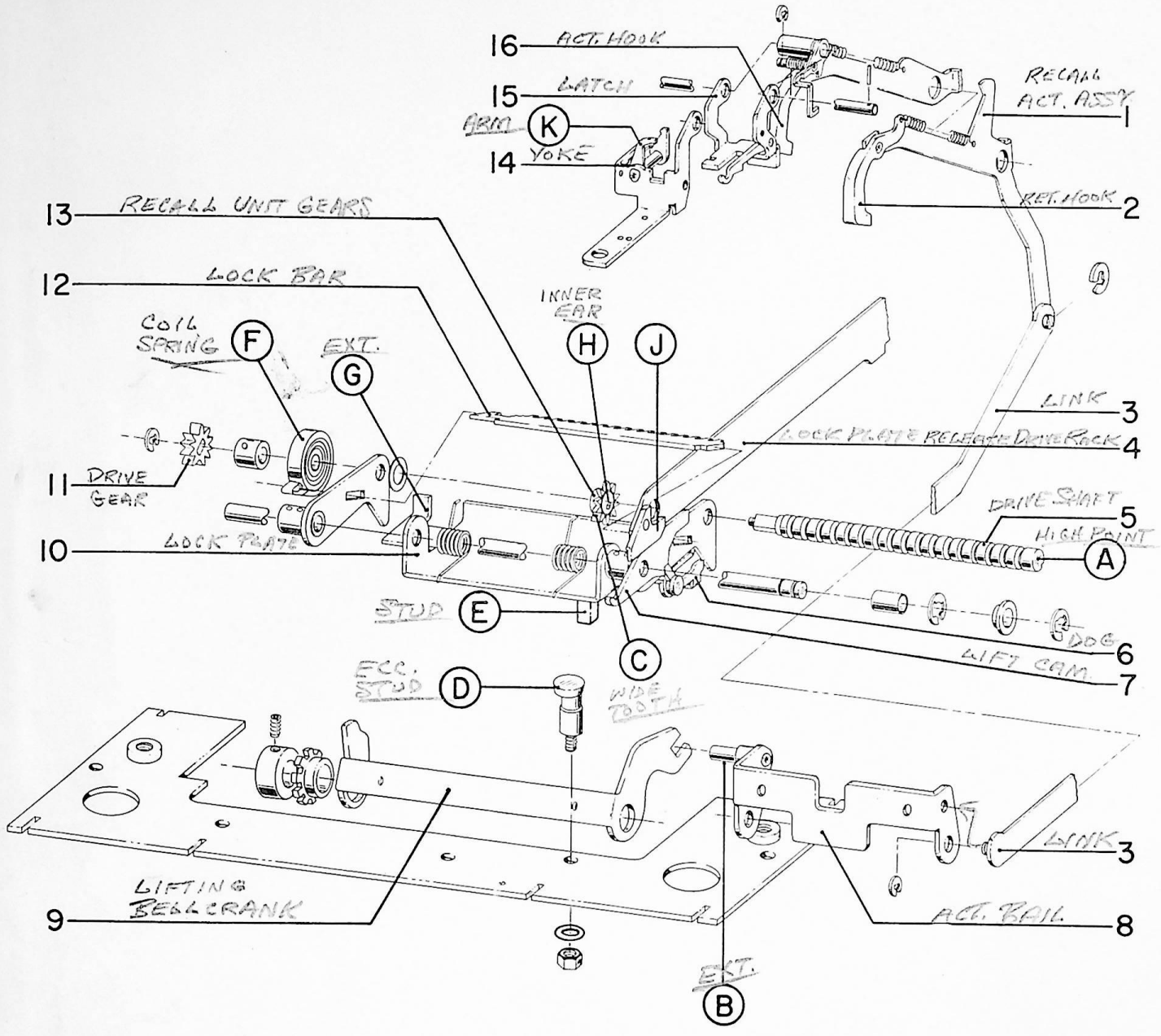
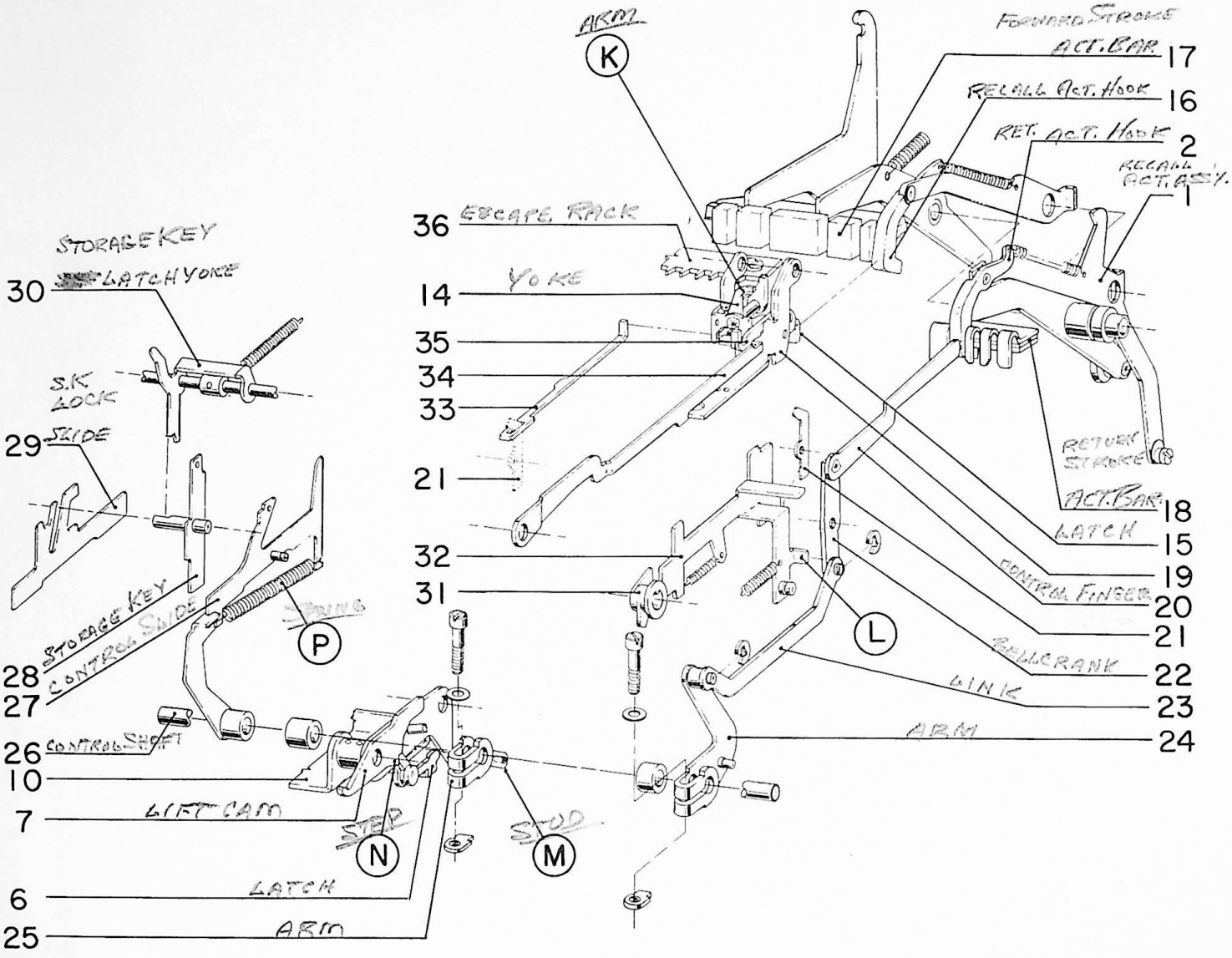


PLATE 6

TRANSFER RACKS & DRIVE


16 ACT. HOOK
15 LATCH
ARM K
14 YOKE
RECALL ACT. ASSY. 1
RET. HOOK 2
13 RECALL UNIT GEARS
12 LOCK BAR
COIL SPRING F
EXT. G
INNER EAR H
J
LINK 3
LOCK PLATE RELEASE DRIVE ROCK 4
11 DRIVE GEAR
DRIVE SHAFT 5
HIGH POINT A
10 LOCK PLATE
STUD E
DOG 6
LIFT CAM 7
ECC. STUD D
WIDE TOOTH
C
LINK 3
LIFTING BELLCRANK 9
ACT. RAIL 8
EXT. B


ARM
K
FORWARD STROKE ACT. BAR
17
RECALL ACT. HOOK
16
RET. ACT. HOOK
2
RECALL ACT. ASS'Y.
1
36 ESCAPE RACK
14 YOKE
35
34
33
21
32
31
STORAGE KEY
LATCH YOKE
30
S.K. LOCK
SLIDE
29
STORAGE KEY
CONTROL SLIDE
28
27
SPRING
P
CONTROL SHAFT
26
10
LIFT CAM
7
STEP
N
STUD
M
LATCH
6
ARM
25
RETURN STROKE ACT. BAR
18
LATCH
15
CONTROL FINGER
19
20
21
L
BELLCRANK
22
LINK
23
ARM
24

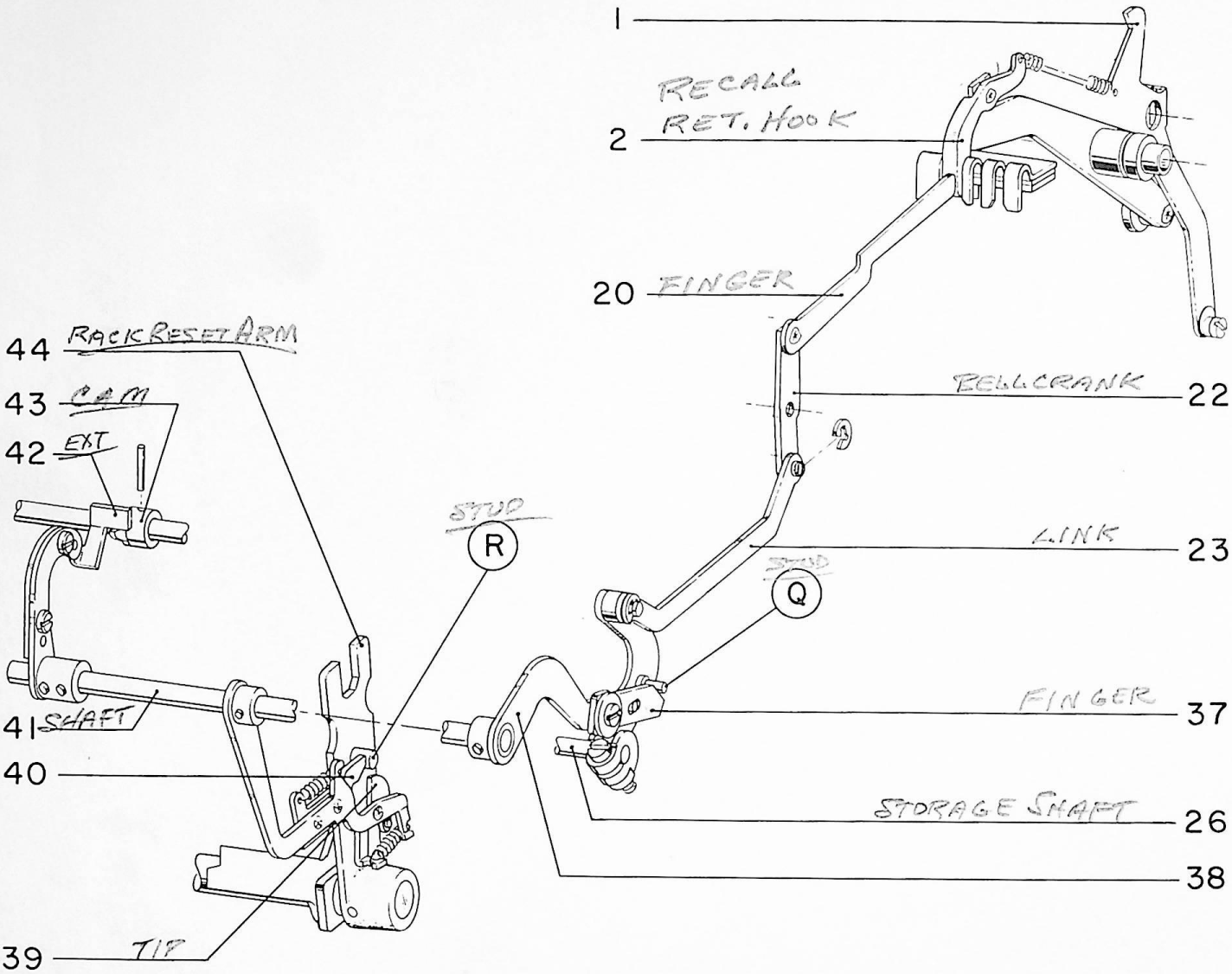


PLATE 7.2 RECALL UNIT (MULT. CONTROL)

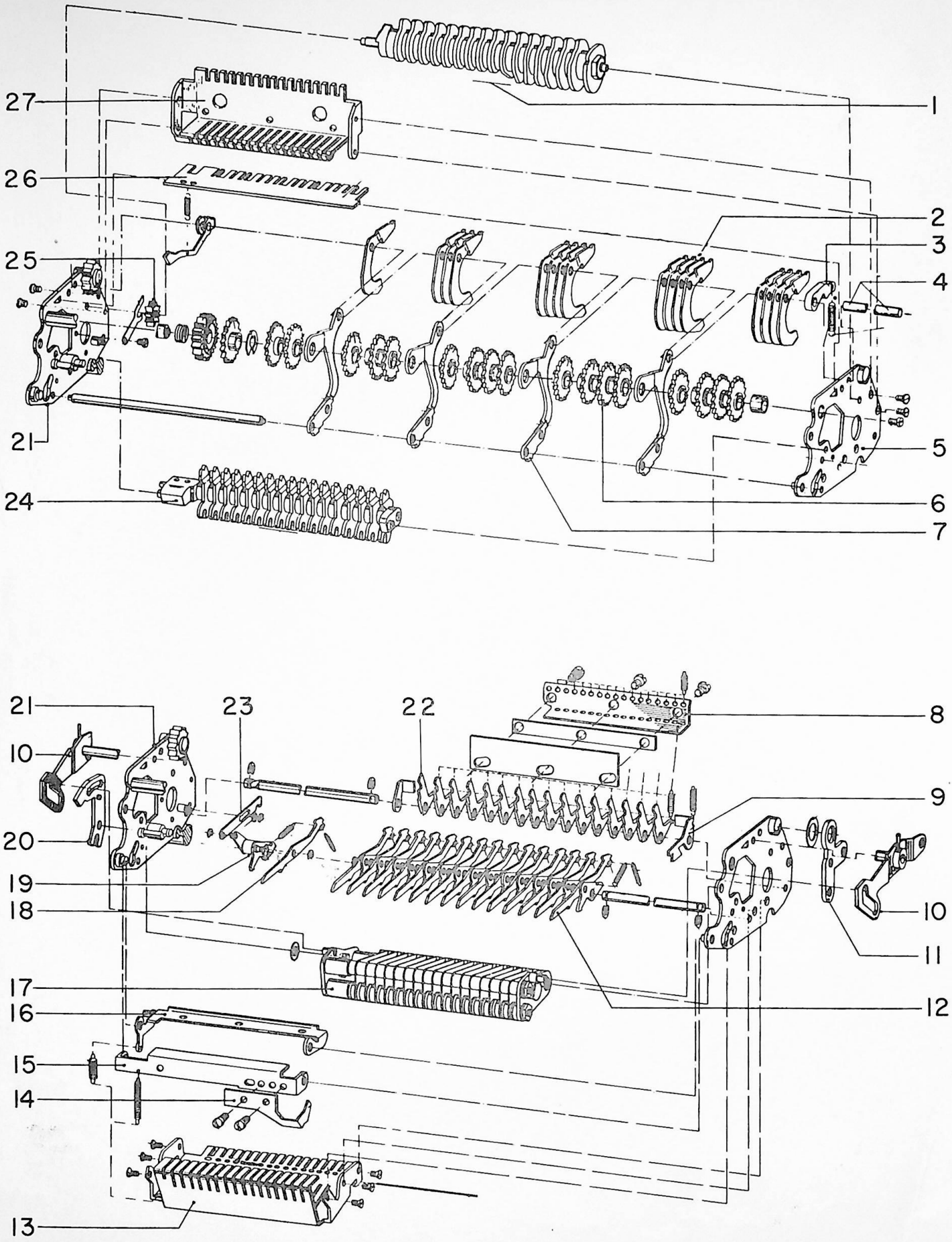


PLATE 8 ACCUMULATOR UNIT

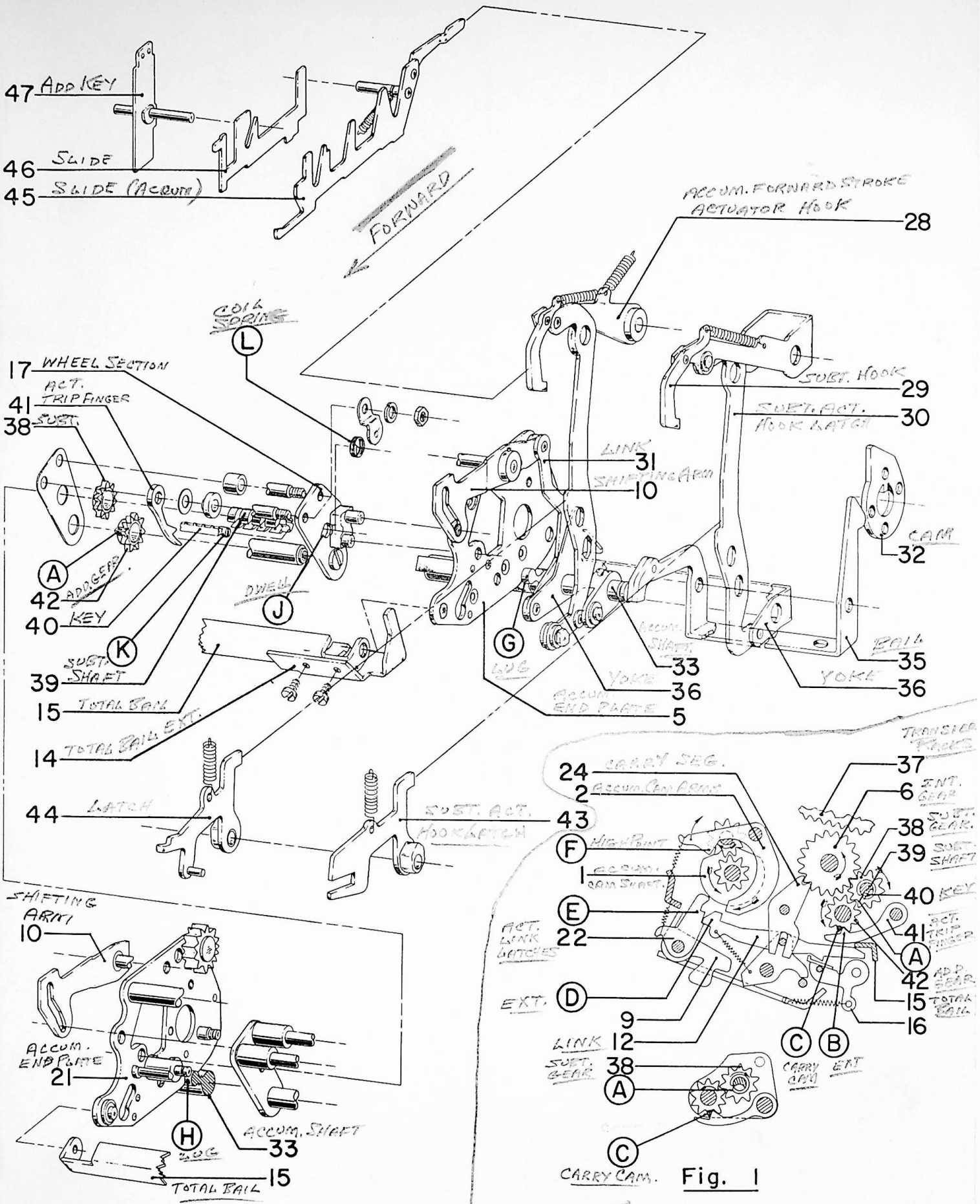
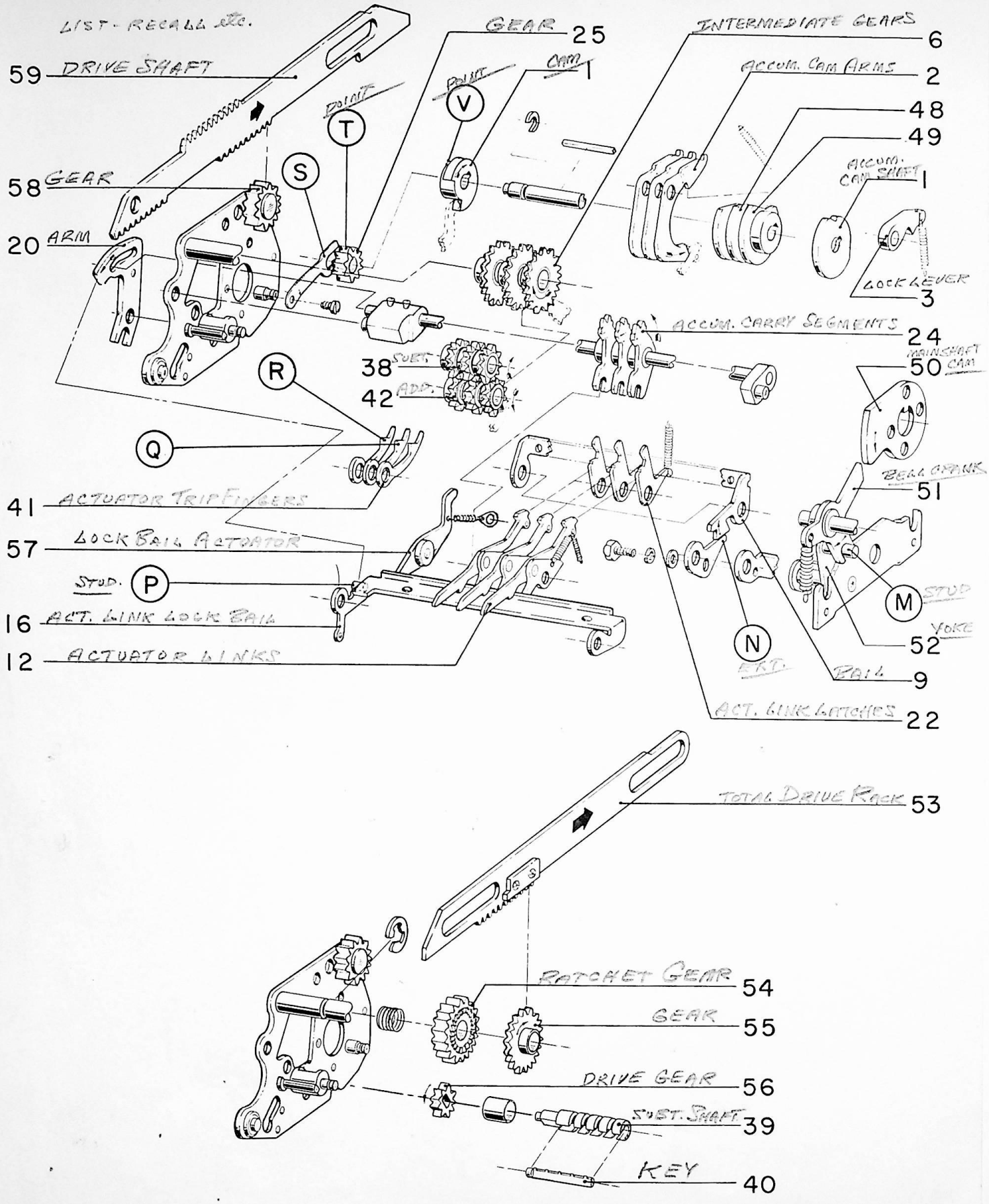


Fig. 1

PLATE 8.1

BACKWARDS

ACCUMULATION


LIST - RECALL ETC.
59 DRIVE SHAFT
58 GEAR
20 ARM
GEAR 25
CAM 1
POINT V
POINT T
S
R
Q
38 SUST.
42 ADD.
INTERMEDIATE GEARS 6
ACCUM. CAM ARMS 2
48
49
ACCUM. CAM SHAFT 1
LOCK LEVER 3
ACCUM. CARRY SEGMENTS 24
MAINSHAFT CAM 50
BELL CRANK 51
M STUD
YOKE 52
N
ERD.
BAIL 9
ACT. LINK LATCHES 22
41 ACTUATOR TRIP FINGERS
57 LOCK BAIL ACTUATOR
STUD. P
16 ACT. LINK LOCK BAIL
12 ACTUATOR LINKS
TOTAL DRIVE RACK 53
RATCHET GEAR 54
GEAR 55
DRIVE GEAR 56
SUST. SHAFT 39
KEY 40

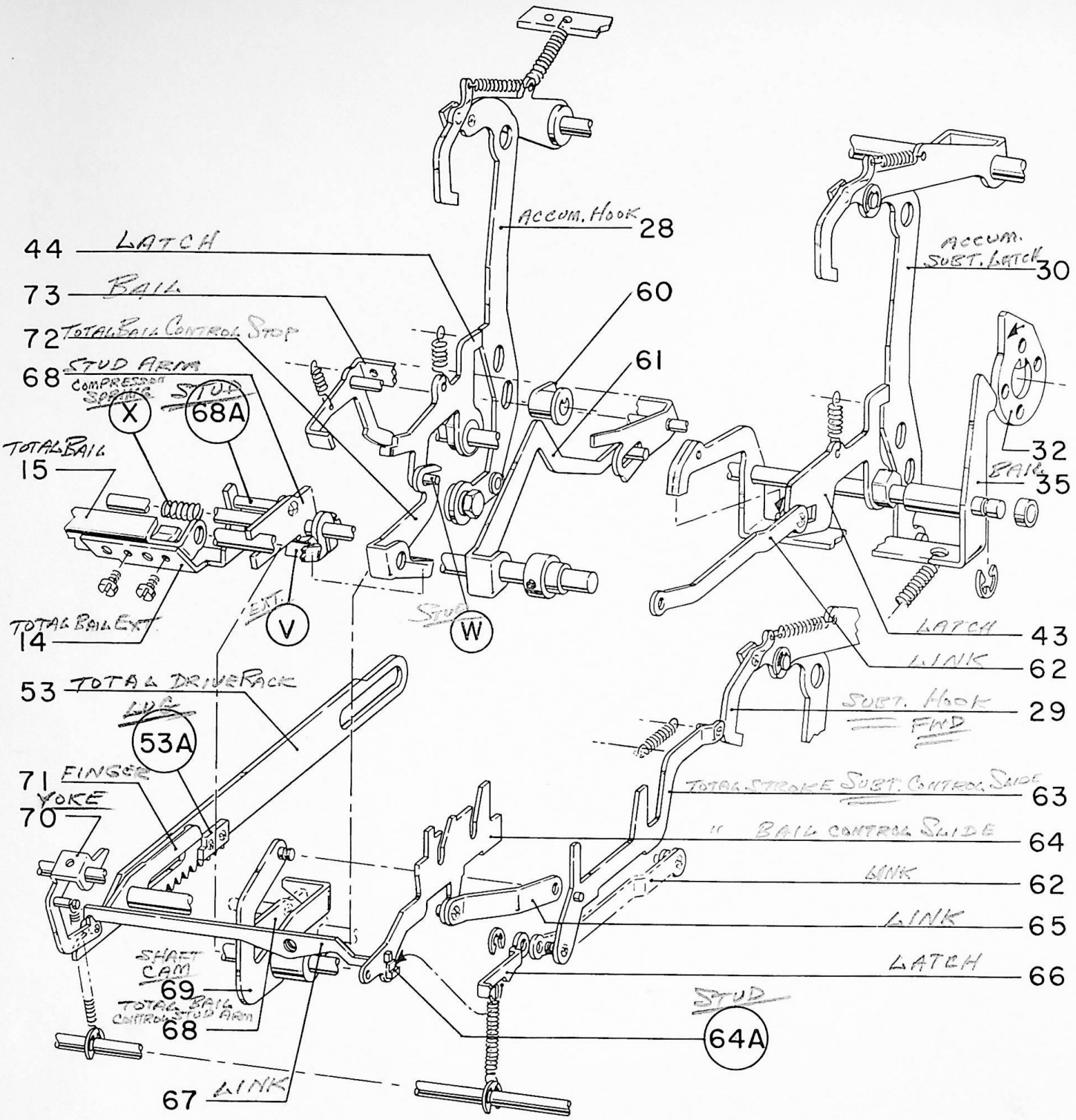
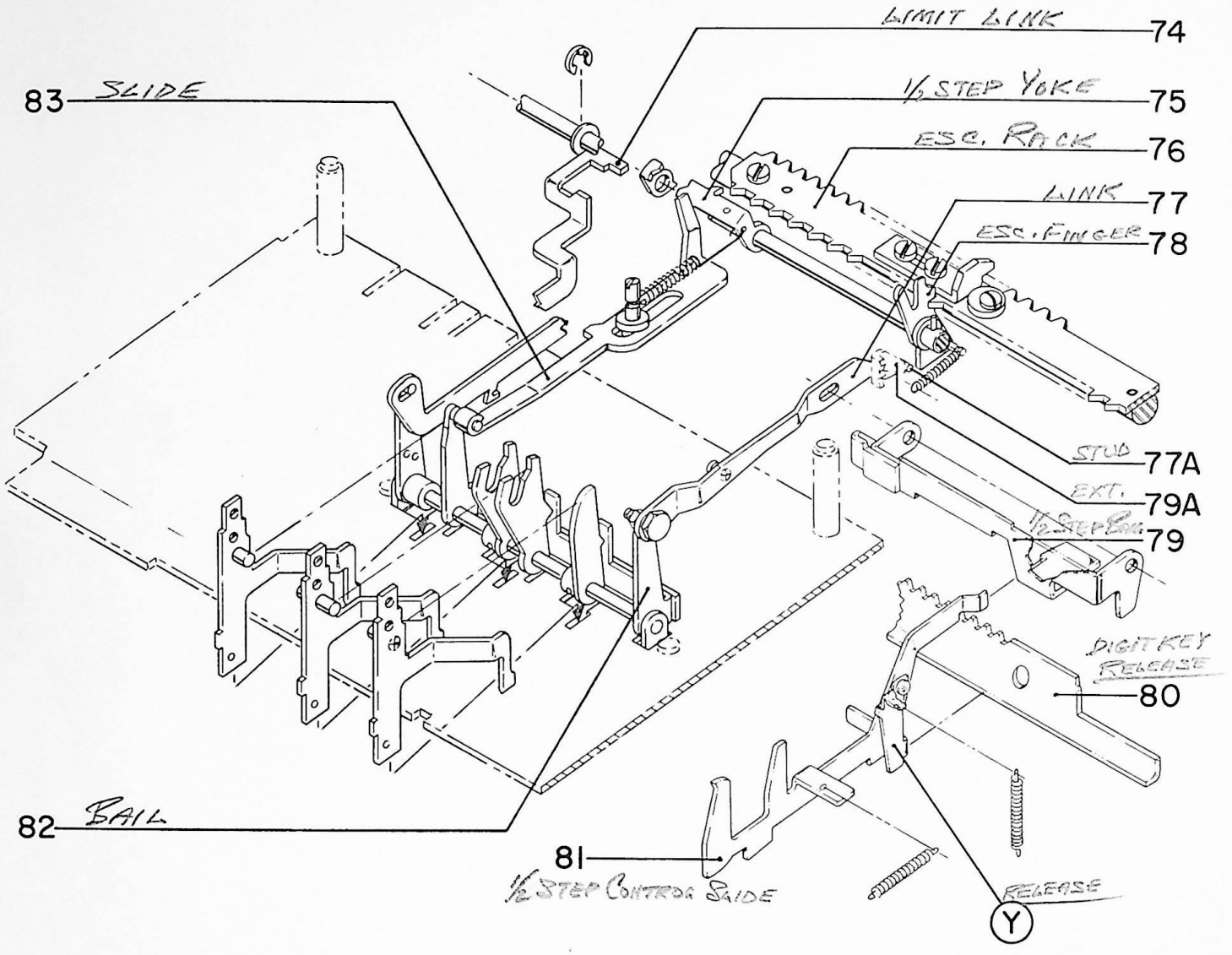
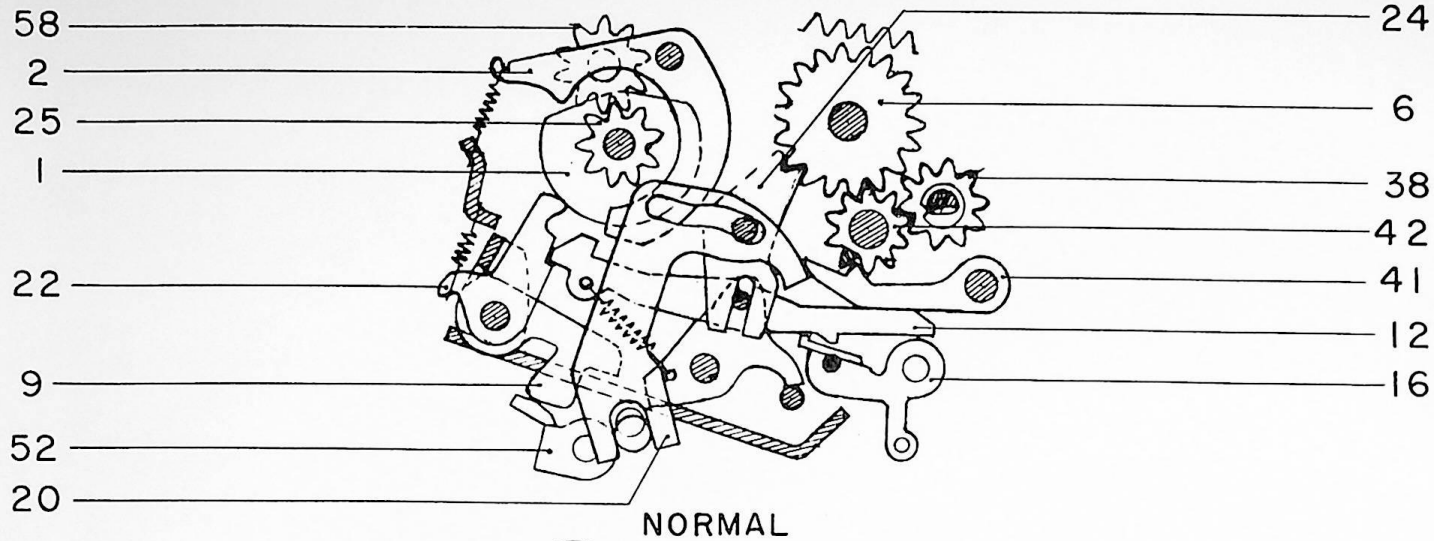


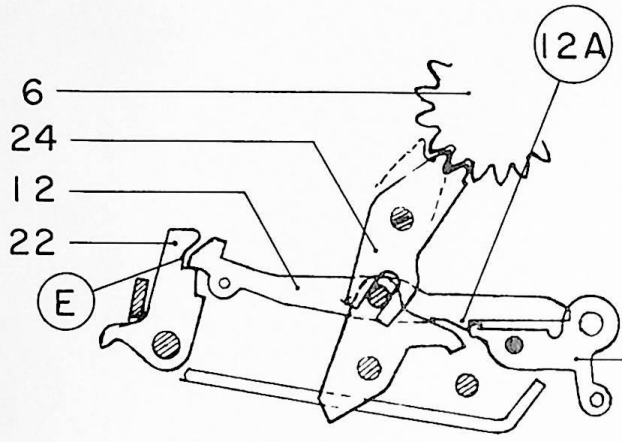
PLATE 8.3

ACCUMULATION (TOTAL)

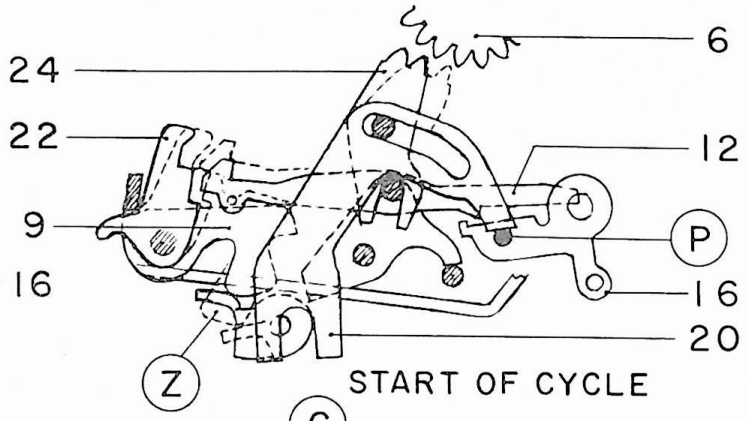

LIMIT LINK
74
83 SLIDE
1/2 STEP YOKE
75
ESC. ROCK
76
LINK
77
ESC. FINGER
78
STUD
77A
EXT.
79A
1/2 SLV. BAR
79
DIGIT KEY RELEASE
80
82 BAIL
81
1/2 STEP CONTROL SLIDE
RELEASE
Y



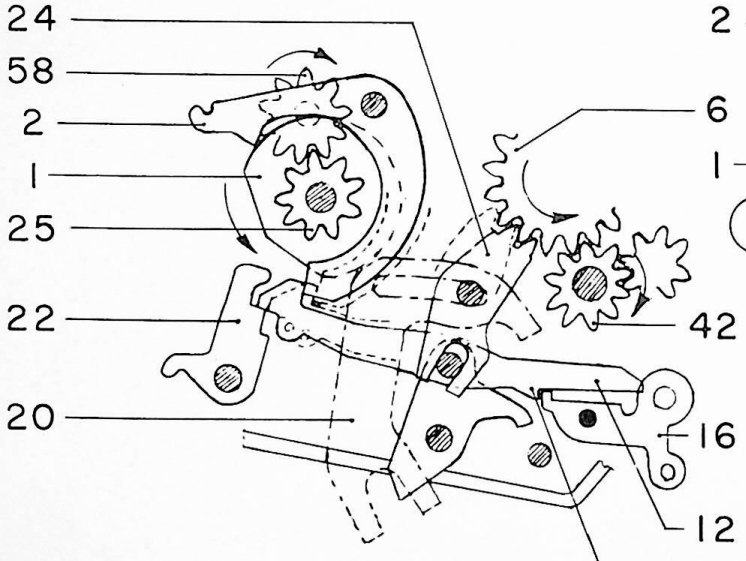
NORMAL



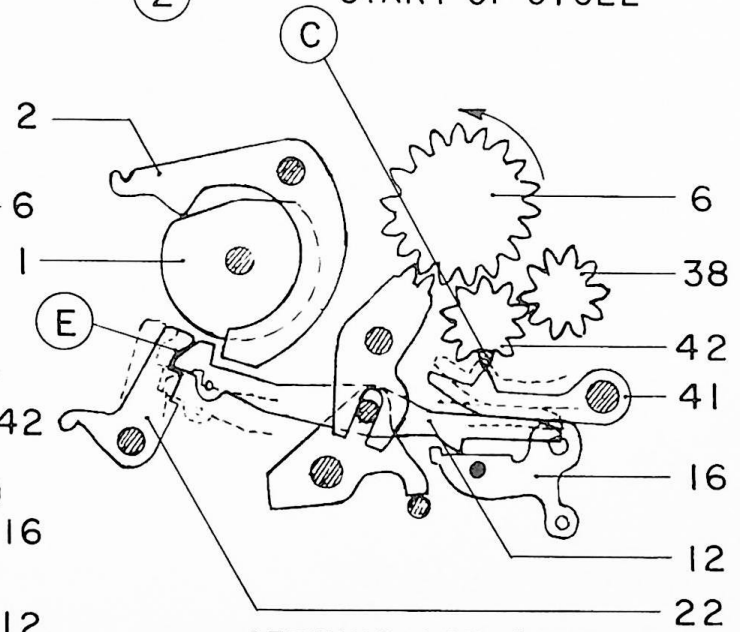
AFTER CARRY AT
END OF CYCLE



START OF CYCLE



CARRY ON RETURN STROKE



SETTING ACTUATOR LINKS
FOR CARRY

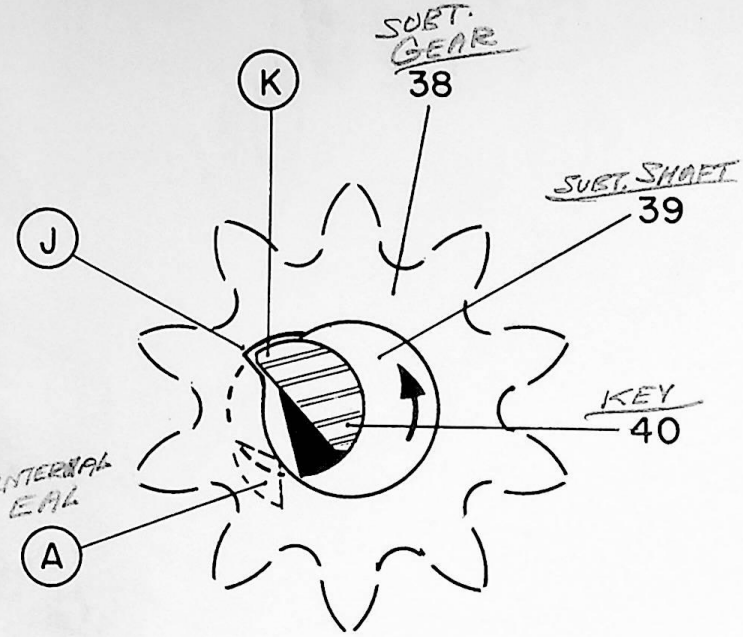


FIG. 1

Normal position

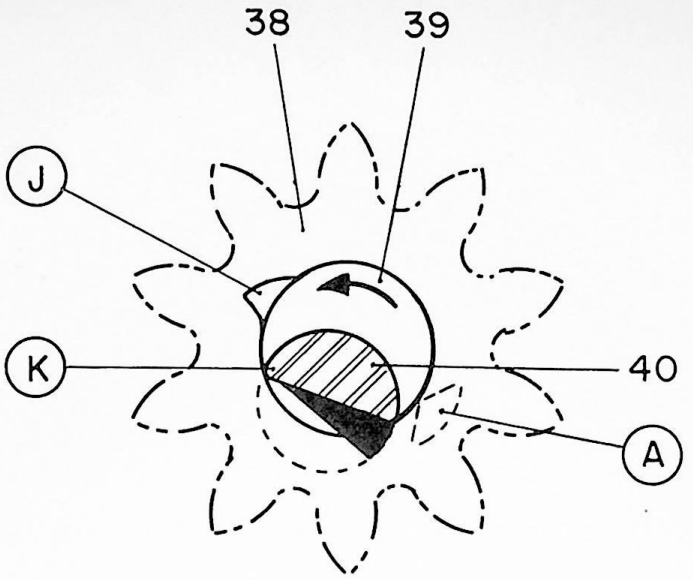


FIG. 2

Key in position to intercept internal ear of subtract gear

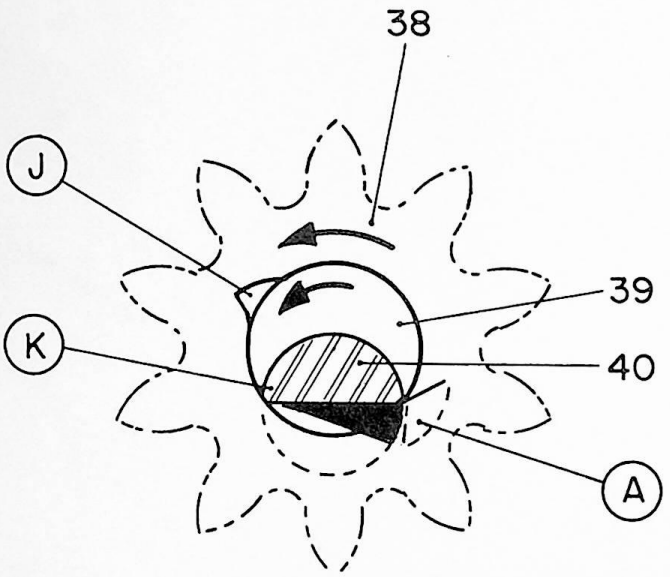


FIG. 3

Key driving subtract gear by contacting internal ear

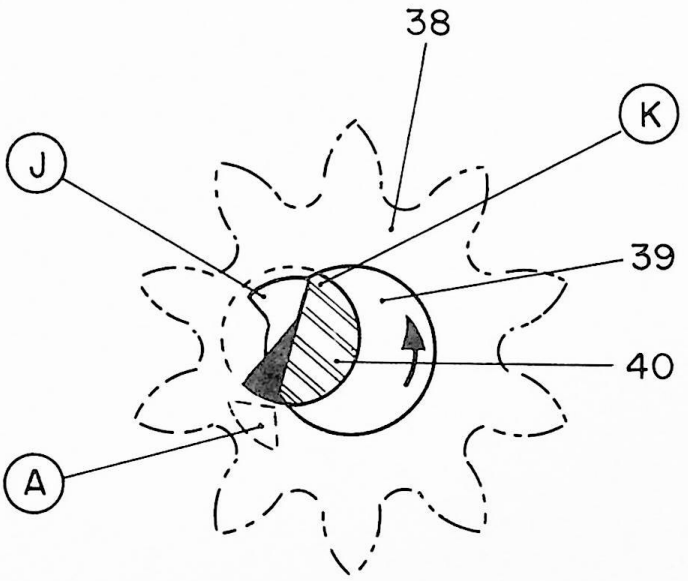
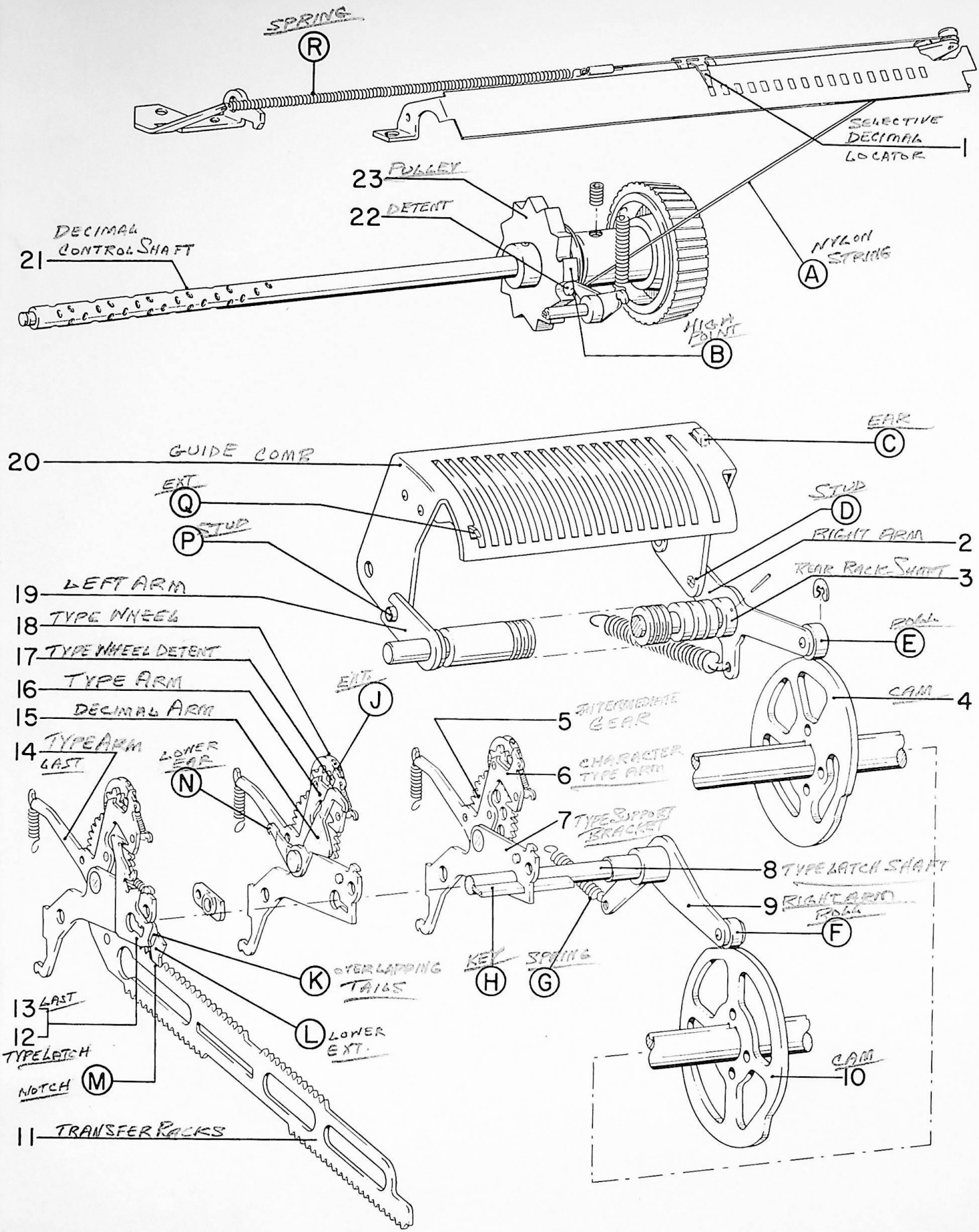
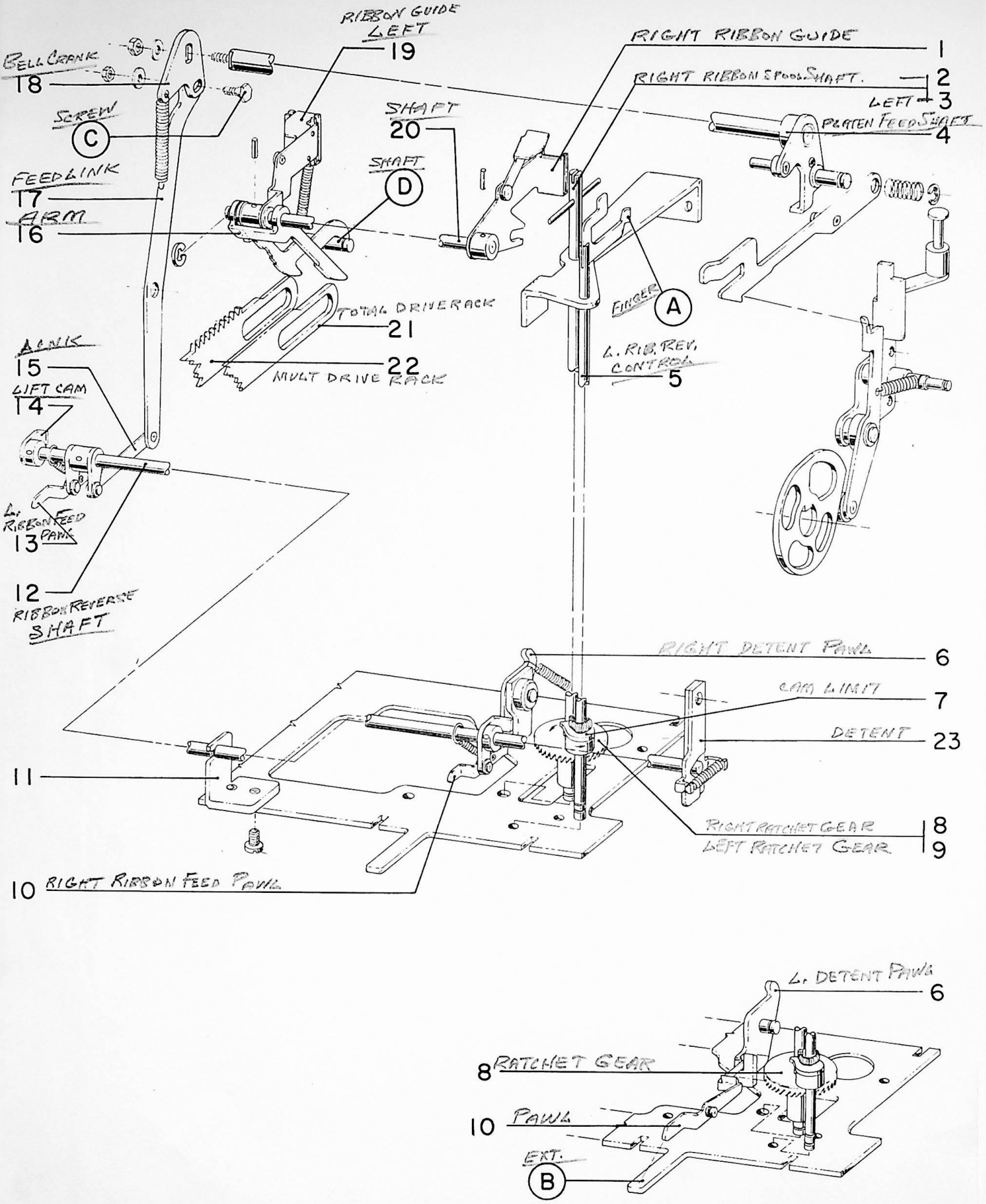


FIG. 4

Key in position to enter dwell of accumulator end plate


SPRING
R
SELECTIVE DECIMAL LOCATOR
1
23 PULLEY
22 DETENT
DECIMAL CONTROL SHAFT
21
NYLON STRING
A
HIGH POINT
B
EAR
C
20 GUIDE COMB
EXT.
Q
STUD
D
P
STUD
RIGHT ARM
2
REAR RACK SHAFT
3
19 LEFT ARM
18 TYPE WHEEL
17 TYPE WHEEL DETENT
16 TYPE ARM
15 DECIMAL ARM
14 TYPE ARM LAST
EXT.
J
LOWER EAR
N
5 INTERMEDIATE GEAR
6 CHARACTER TYPE ARM
7 TYPE SUPPORT BRACKET
8 TYPE LATCH SHAFT
9 RIGHT ARM
FOUR
F
CAM
4
KEY
H
SPRING
G
K OVERLAPPING TAILS
13 LAST
12
L LOWER EXT.
TYPE LATCH NOTCH
M
CAM
10
11 TRANSFER RACKS


RIBBON GUIDE LEFT
19
RIGHT RIBBON GUIDE
1
RIGHT RIBBON SPOOL SHAFT.
2
LEFT
3
PLATEN FEED SHAFT
4
BELL CRANK
18
SCREW
C
SHAFT
20
SHAFT
D
FEEDLINK
17
ARM
16
TOTAL DRIVE RACK
21
MULT DRIVE RACK
22
FINGER
A
L. RIB. REV. CONTROL
5
ACTUK
15
LIFT CAM
14
L. RIBBON FEED PAWL
13
12
RIBBON REVERSE SHAFT
RIGHT DETENT PAWL
6
CAM LIMIT
7
DETENT
23
11
RIGHT RATCHET GEAR
8
LEFT RATCHET GEAR
9
10
RIGHT RIBBON FEED PAWL

L. DETENT PAWL
6
8
RATCHET GEAR
10
PAWL
EXT.
B

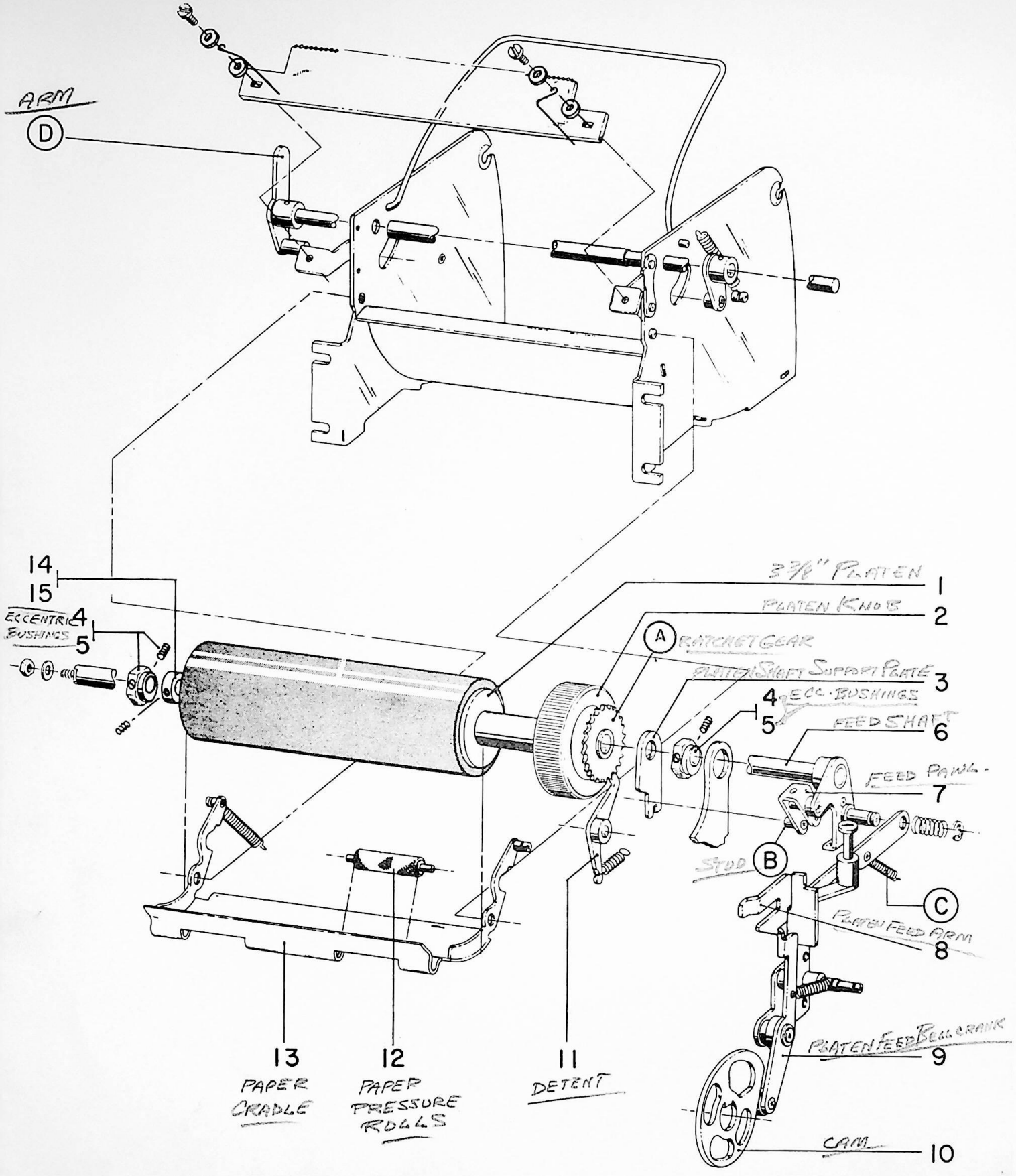


PLATE 11

PAPER CARRIAGE

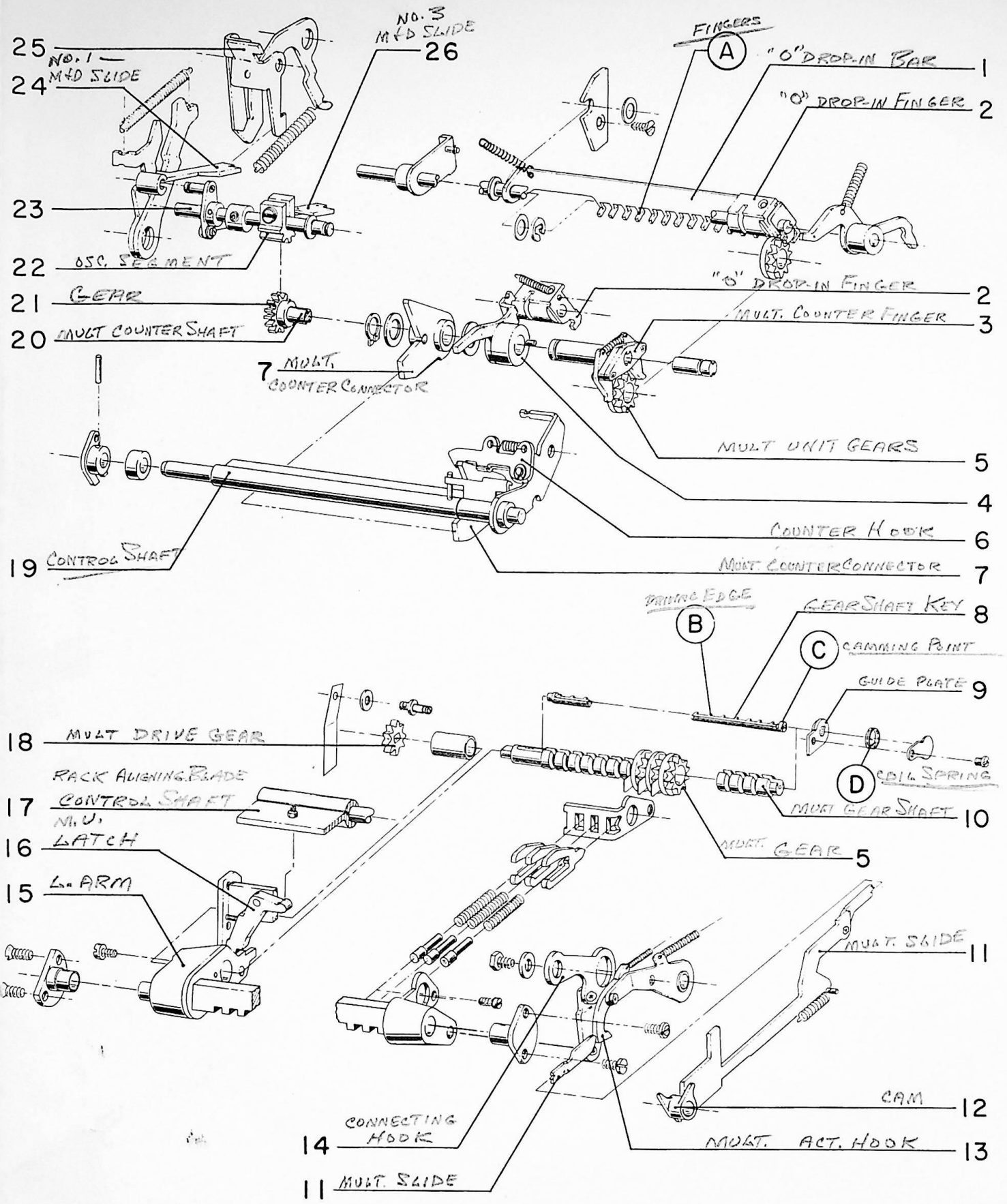


PLATE 12

MULTIPLY UNIT and COUNTER

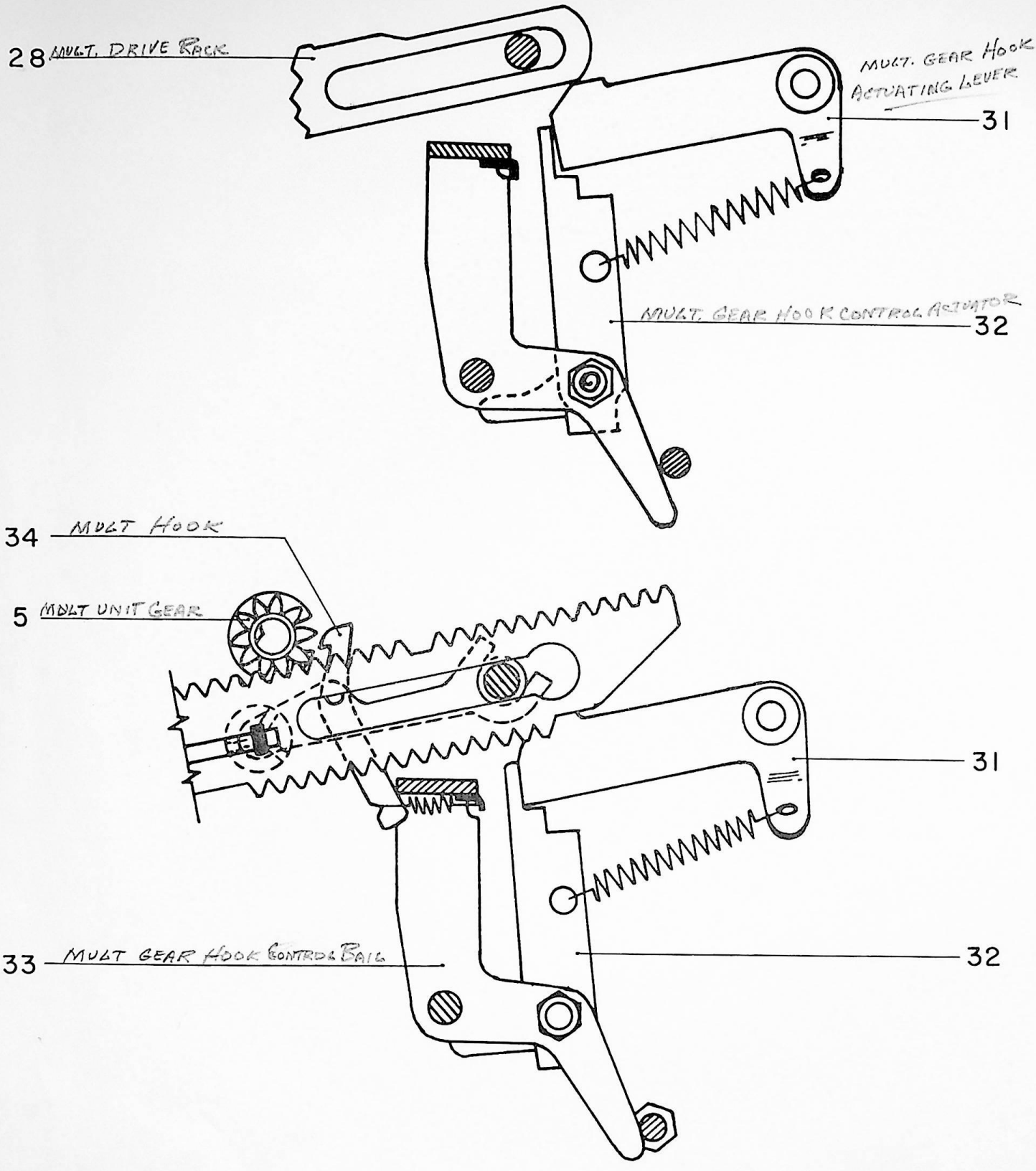


PLATE 12.1 MULT. GEAR HOOK CONTROL

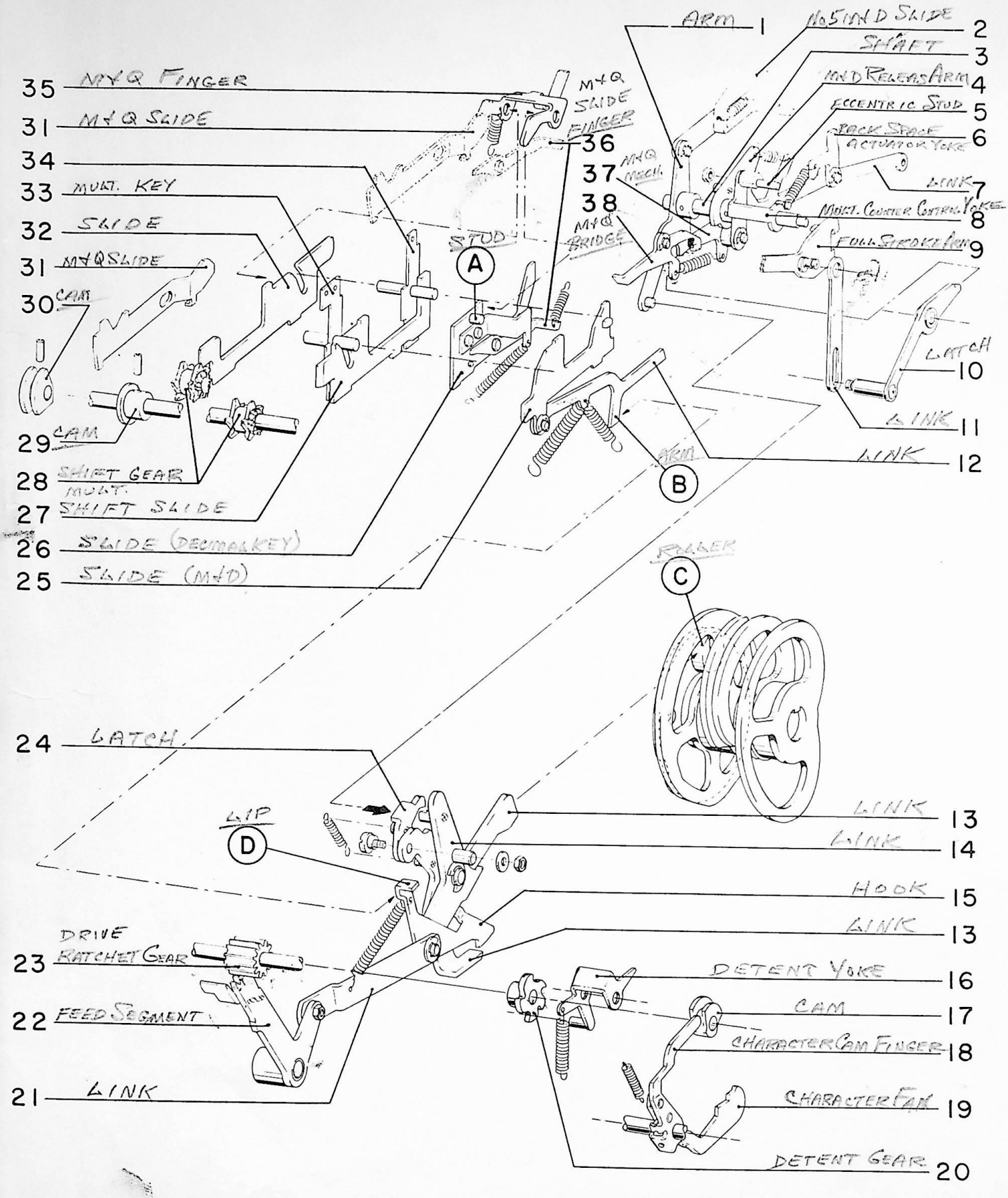
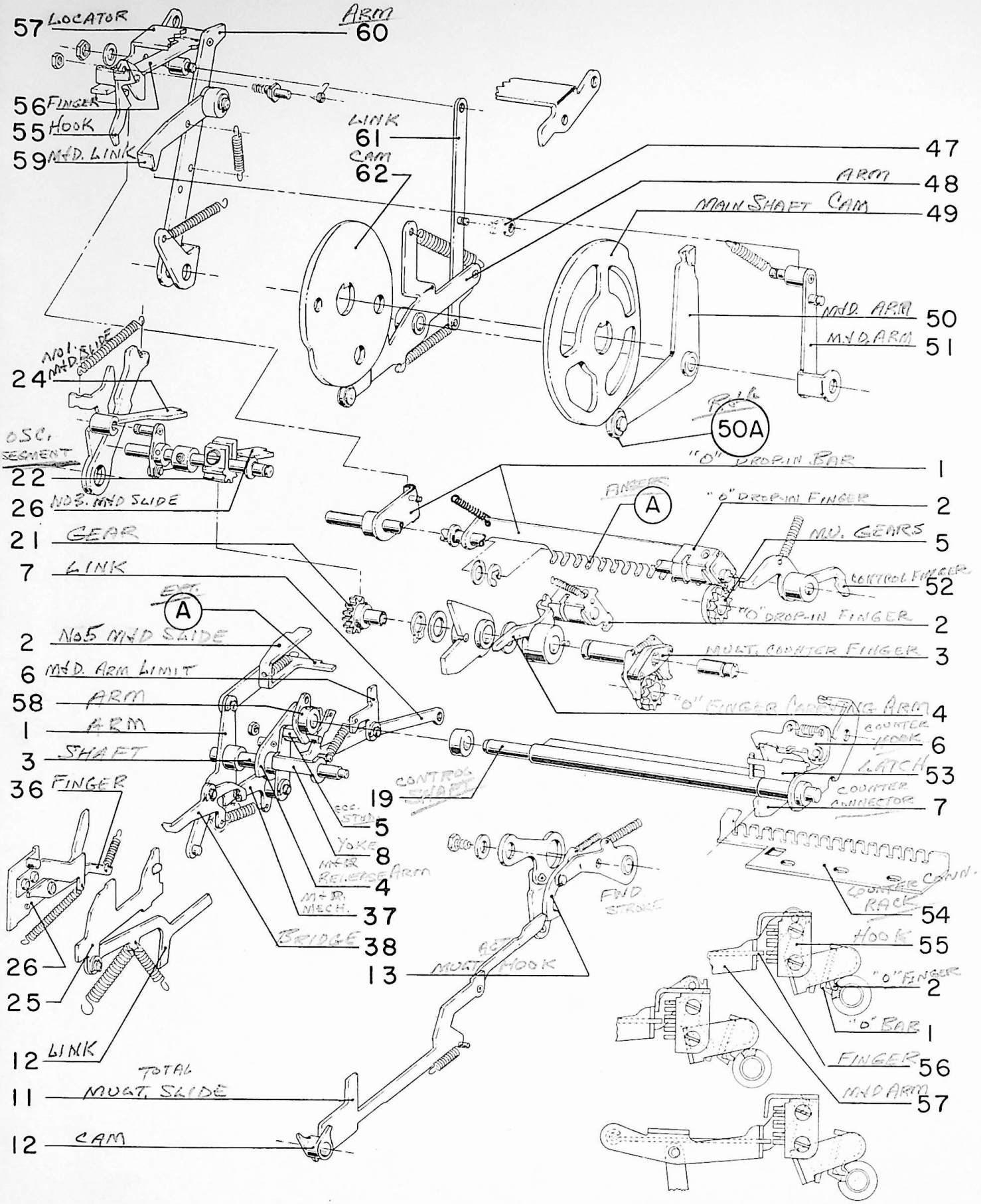


PLATE 13

MULT. and DIV. MECHANISM



LEFT SIDE VIEW

PLATE 13.1

MULT. and DIV. MECHANISM

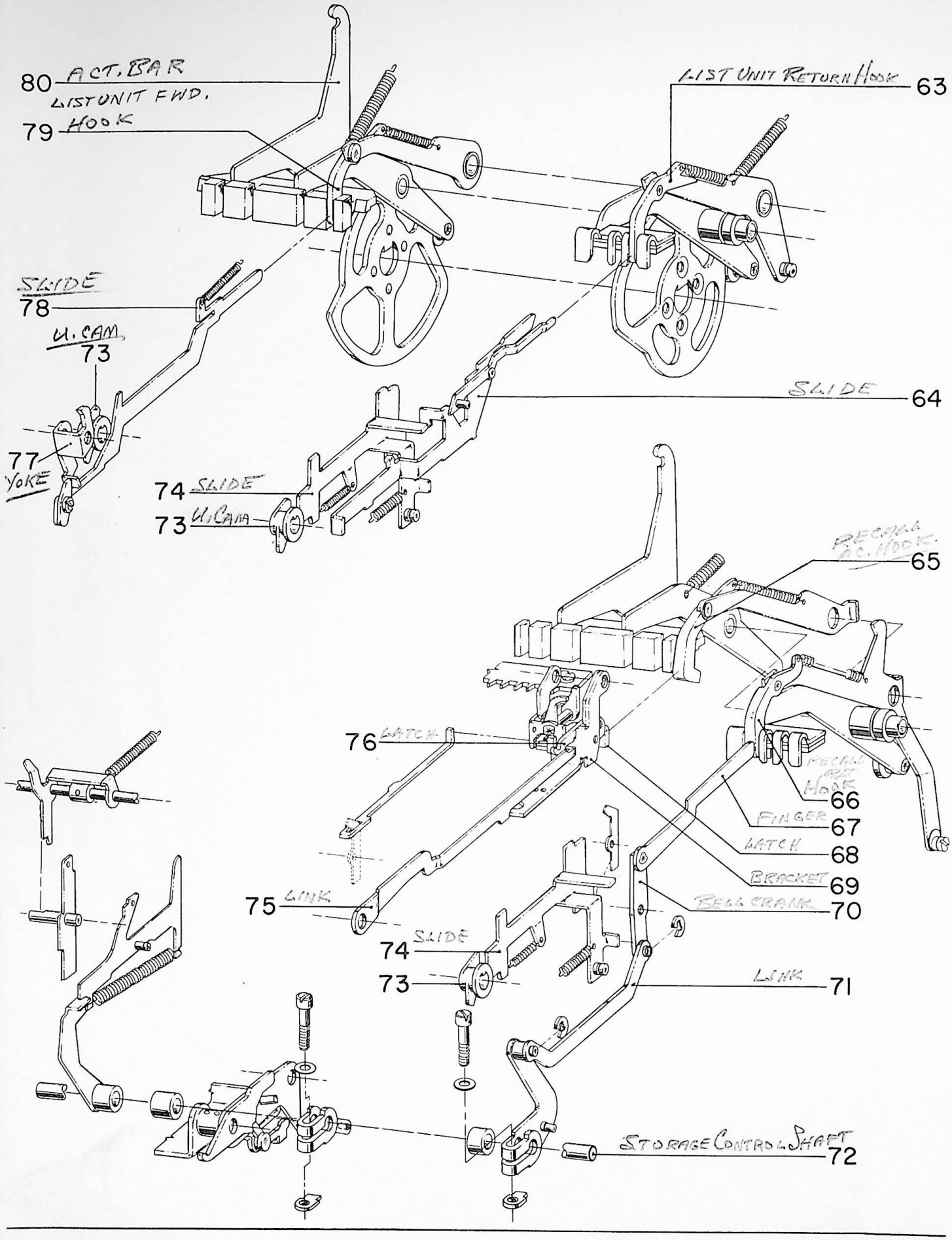


PLATE 13.2 MULT. & DIV. RECALL and LIST UNIT CONTROL

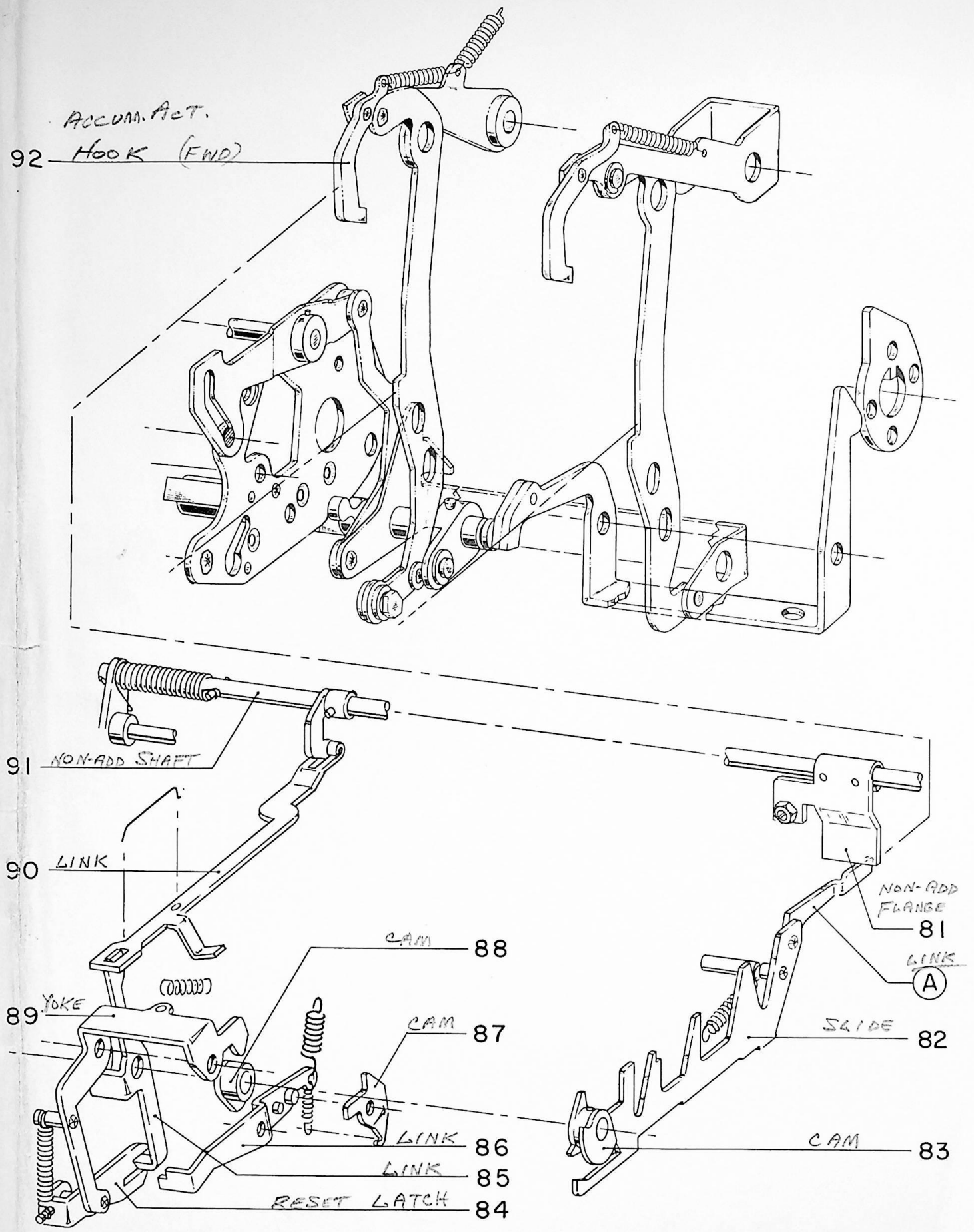
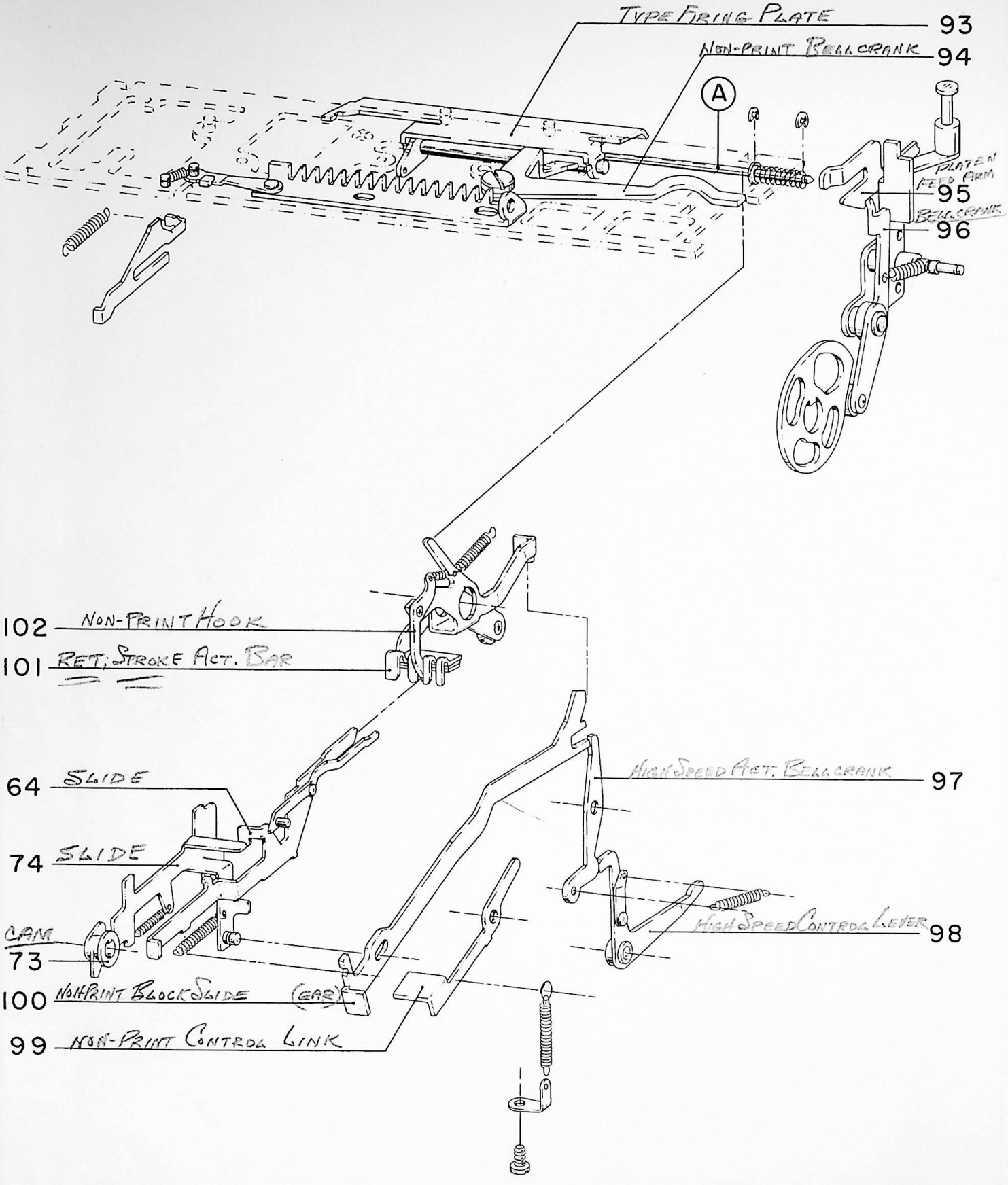


PLATE 13.3

MULT. ACCUMULATOR CONTROL


TYPE FIRING PLATE
93
NON-PRINT BELLCRANK
94
A
PLATEN FEED ARM
95
BELLCRANK
96
102 NON-PRINT HOOK
101 RET. STROKE ACT. BAR
64 SLIDE
74 SLIDE
CAM
73
100 NONPRINT BLOCK SLIDE (GEAR)
99 NON-PRINT CONTROL LINK
HIGH SPEED ACT. BELLCRANK
97
HIGH SPEED CONTROL LEVER
98

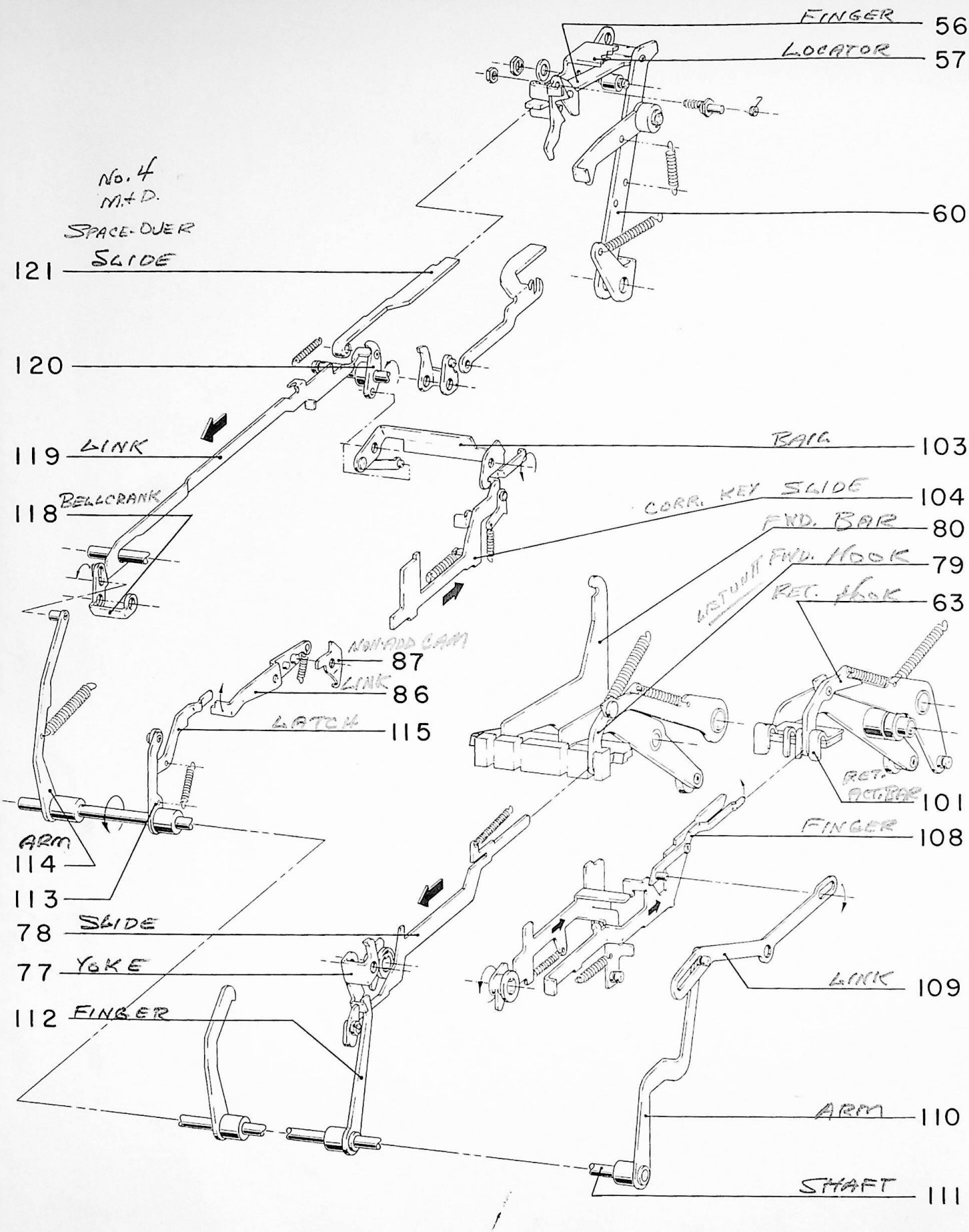
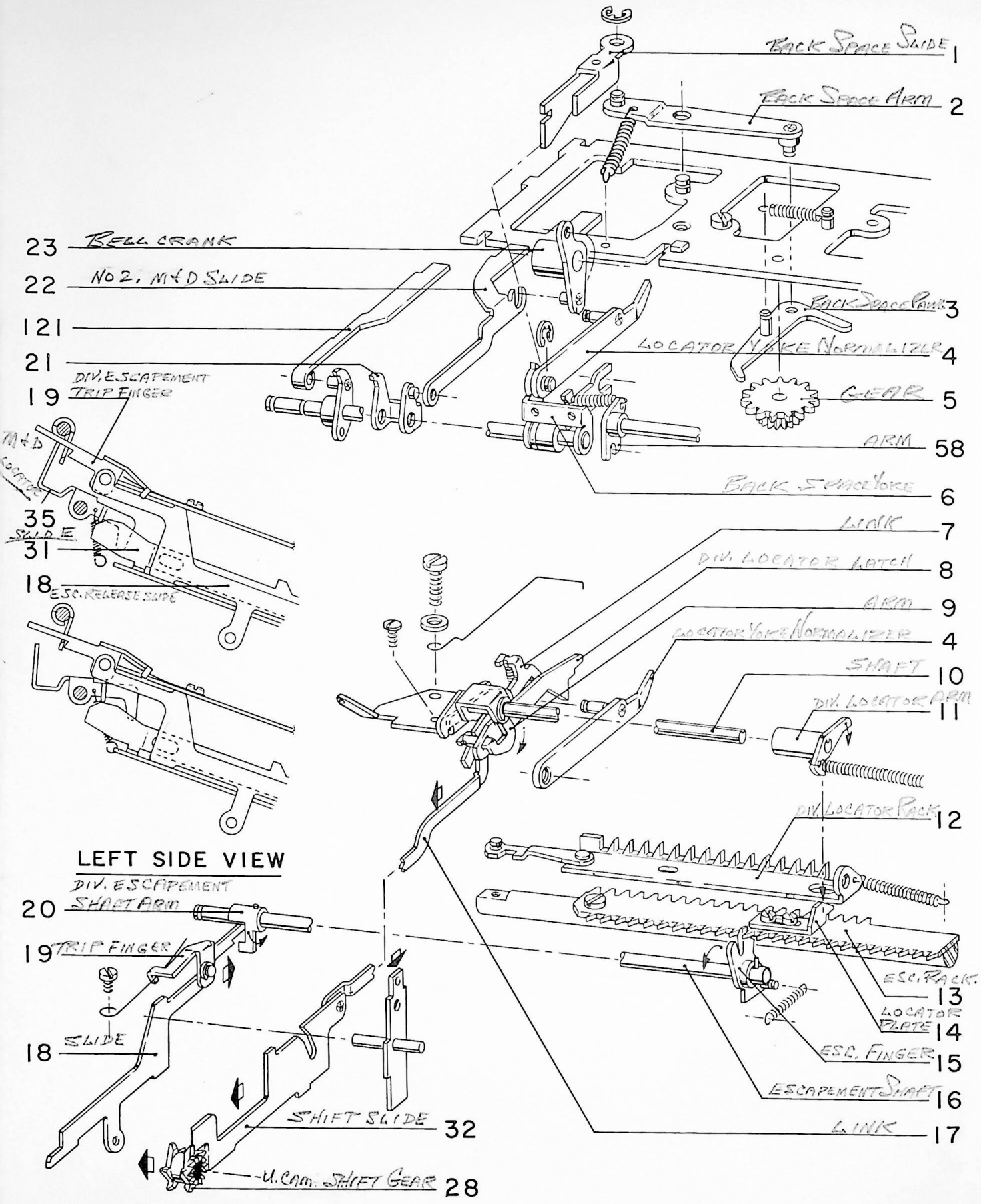


PLATE 13.5 MULT. LIST UNIT CONTROL for SPACE-OVER


BACK SPACE SLIDE 1
BACK SPACE ARM 2
23 BELL CRANK
22 NO 2, M+D SLIDE
121
BACK SPACE PAWL 3
LOCATOR YOKE NORMALIZER 4
21
GEAR 5
DIV. ESCAPEMENT TRIP FINGER
19
ARM 58
BACK SPACE YOKE 6
M+D LOCATOR SLIDE
35
31
LINK 7
DIV. LOCATOR LATCH 8
18 ESC. RELEASE SLIDE
ARM 9
LOCATOR YOKE NORMALIZER 4
SHAFT 10
DIV. LOCATOR ARM 11
DIV. LOCATOR RACK 12
LEFT SIDE VIEW
DIV. ESCAPEMENT
20 SHAFT ARM
19 TRIP FINGER
ESC. RACK 13
LOCATOR PLATE 14
18 SLIDE
ESC. FINGER 15
ESCAPEMENT SHAFT 16
SHIFT SLIDE 32
LINK 17
U. CAM SHIFT GEAR 28

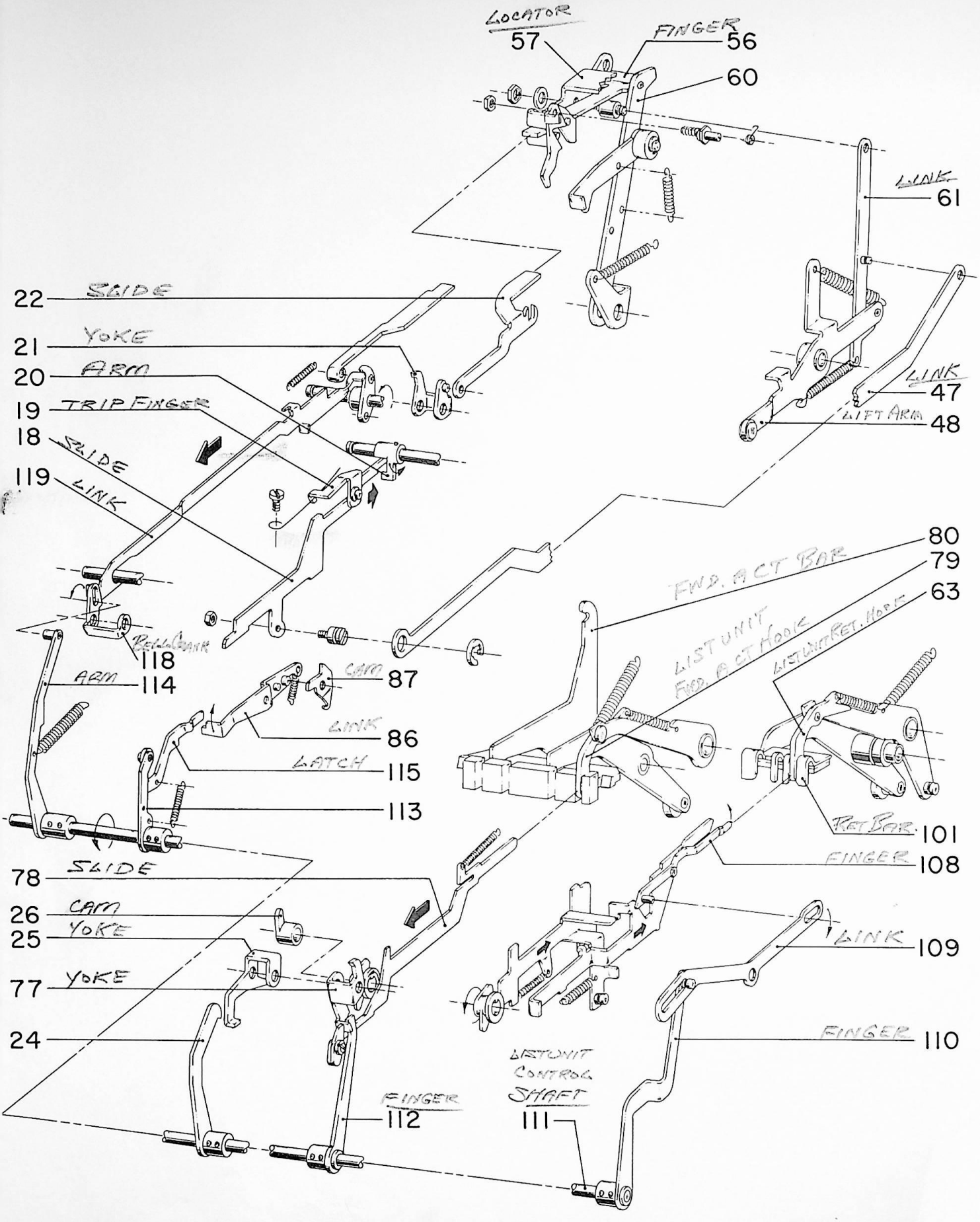
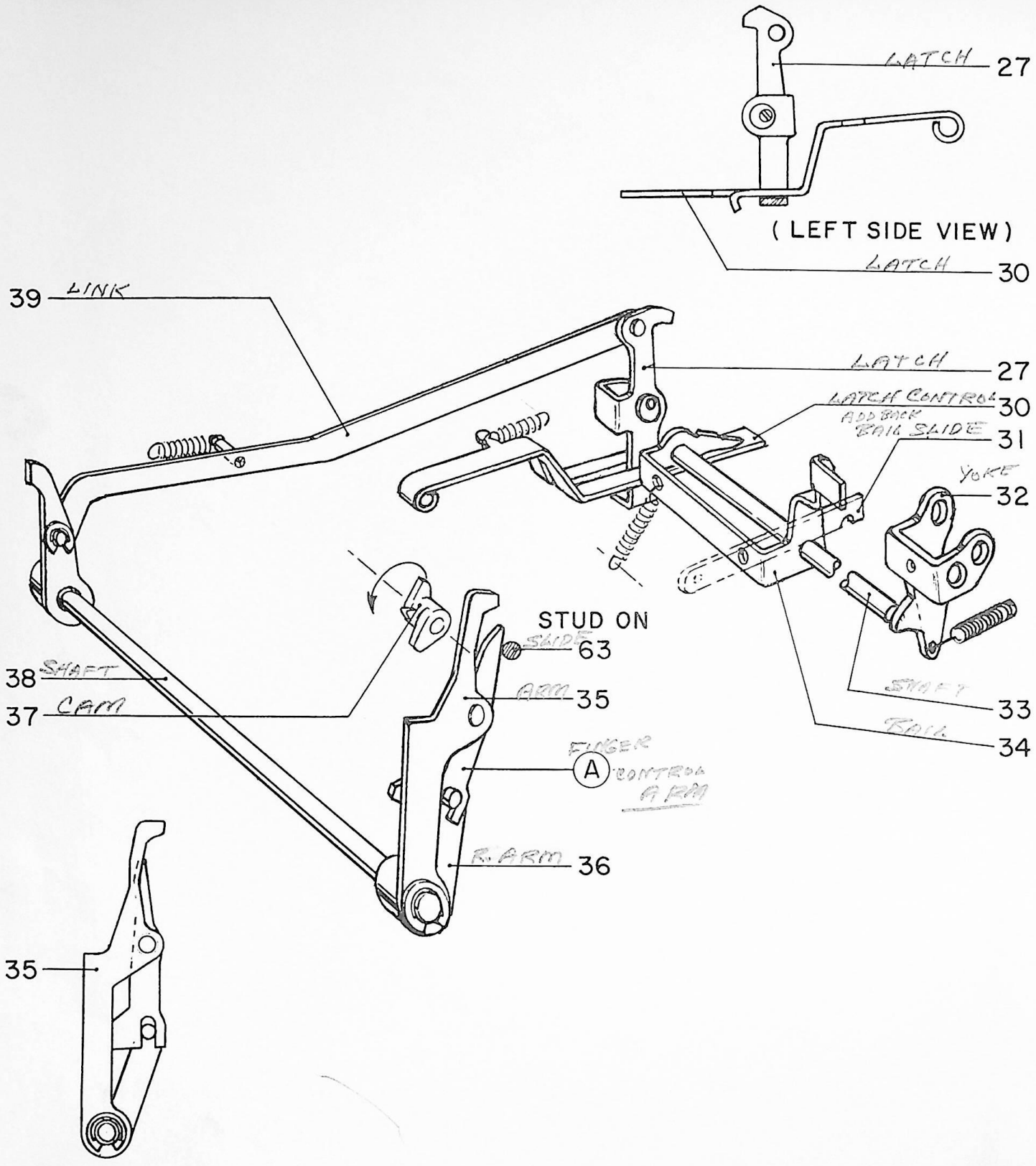
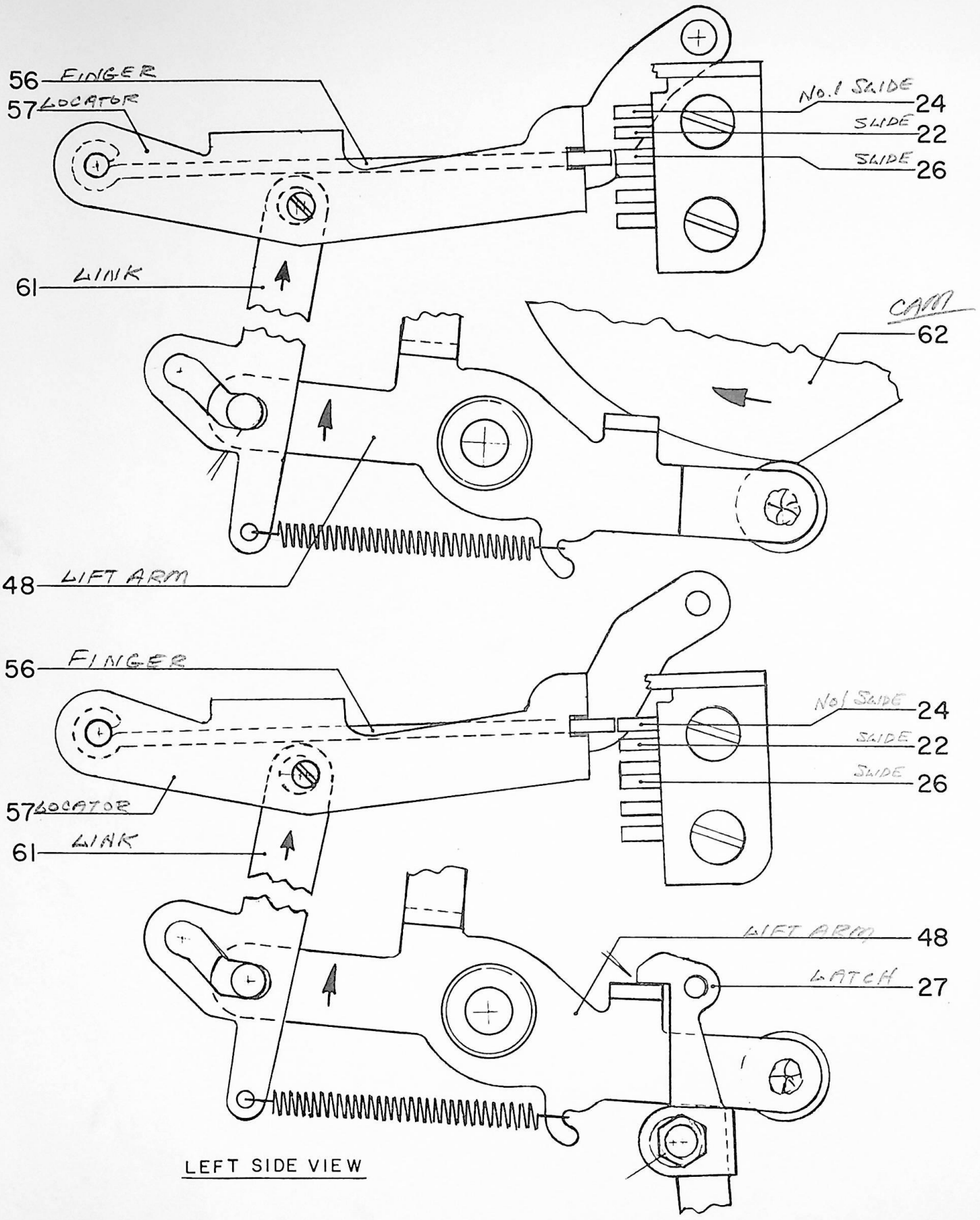
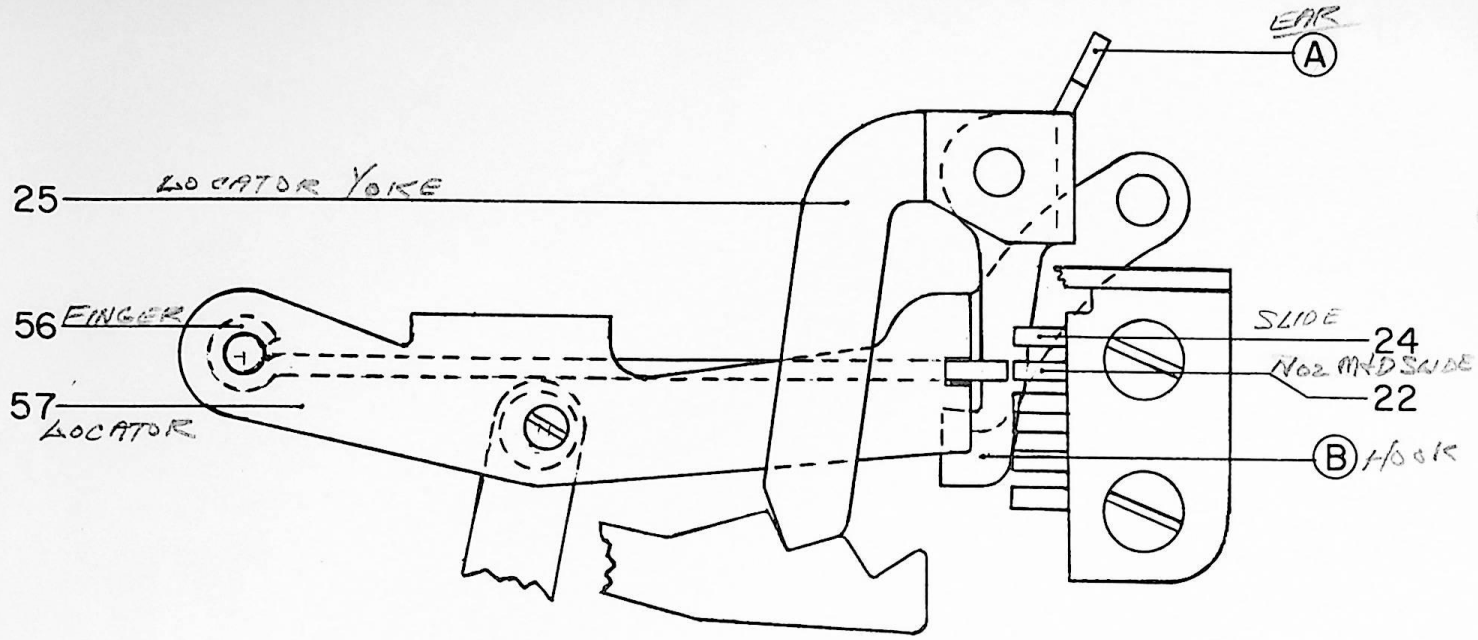


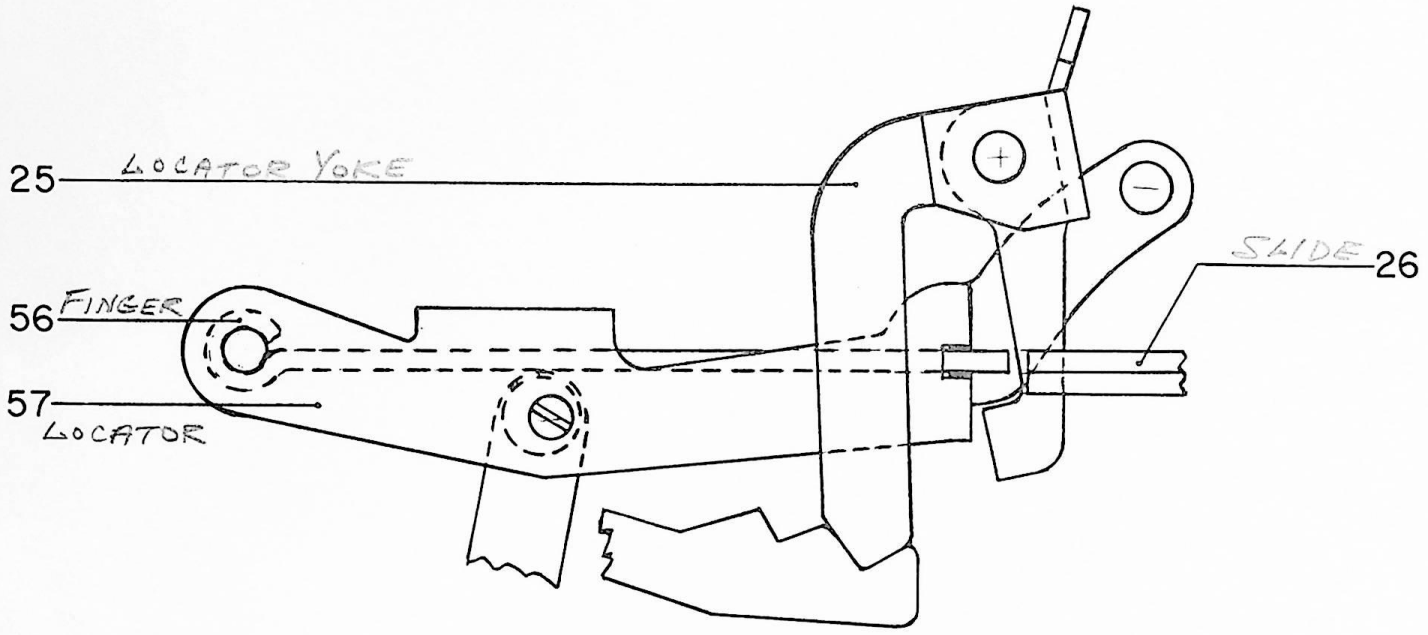
PLATE 14.1 DIV. LIST UNIT CONTROL for BACKSPACE

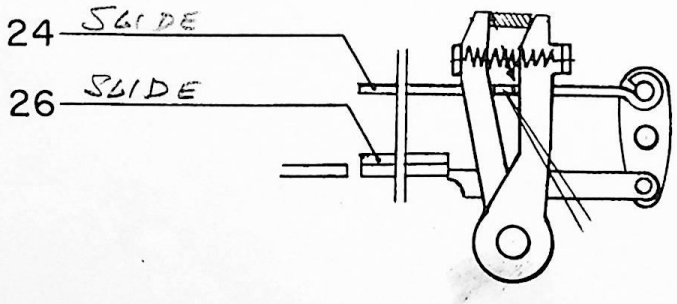

LATCH
27
(LEFT SIDE VIEW)
LATCH
30
39 LINK
LATCH
27
LATCH CONTROL
30
ADD BACK
BAIL SLIDE
31
YOKE
32
STUD ON
SLIDE
63
38 SHAFT
ARM
35
37 CAM
SHAFT
33
ROLL
34
FINGER
A
CONTROL
ARM
R. ARM
36
35
(RIGHT SIDE VIEW)



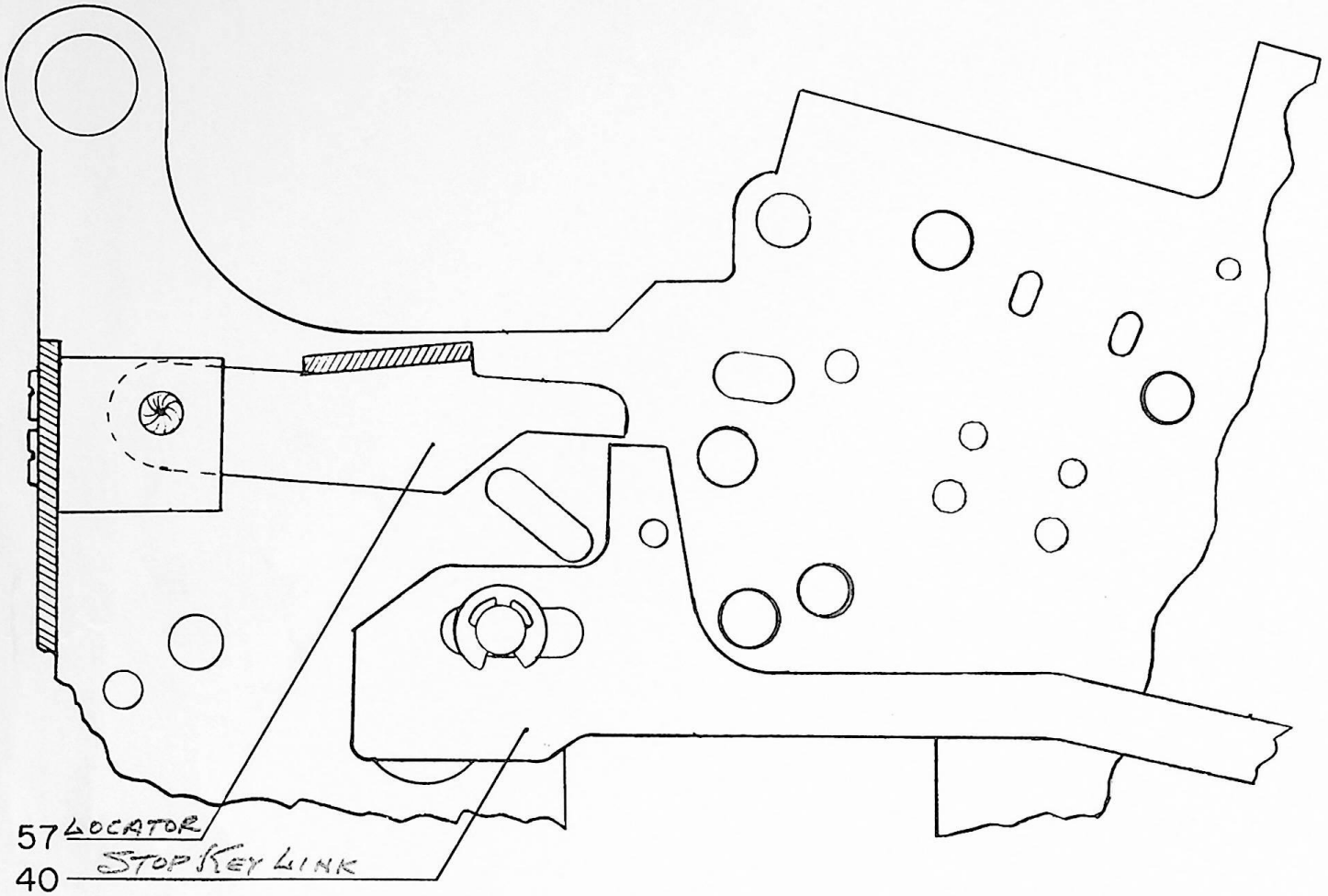
LEFT SIDE VIEW

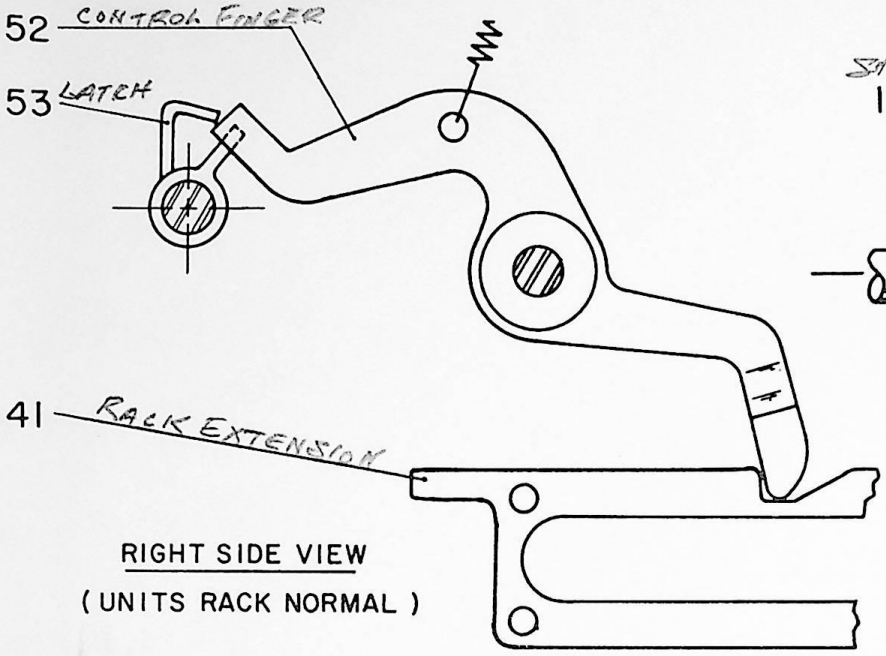






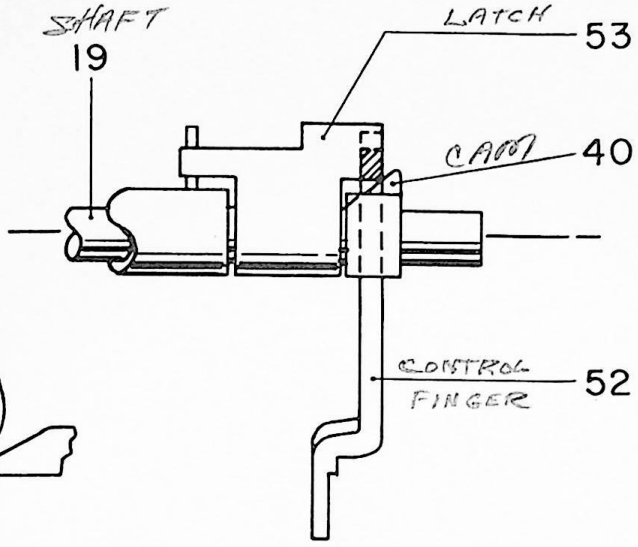
LEFT SIDE VIEW


57 LOCATOR
40 STOP KEY LINK



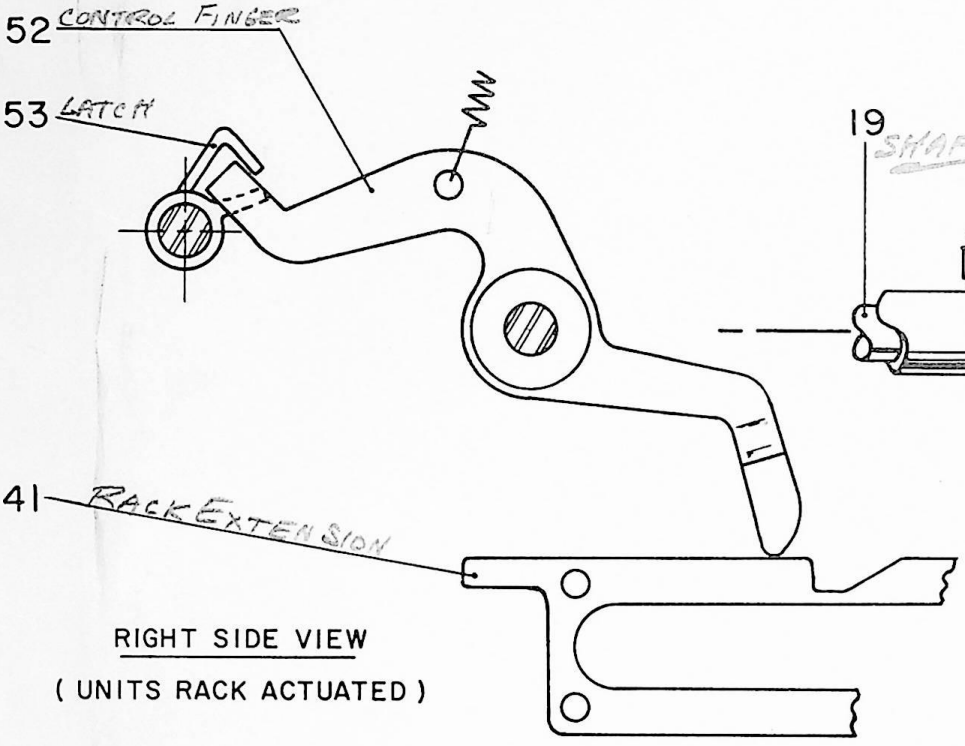
RIGHT SIDE VIEW

(UNITS RACK NORMAL)



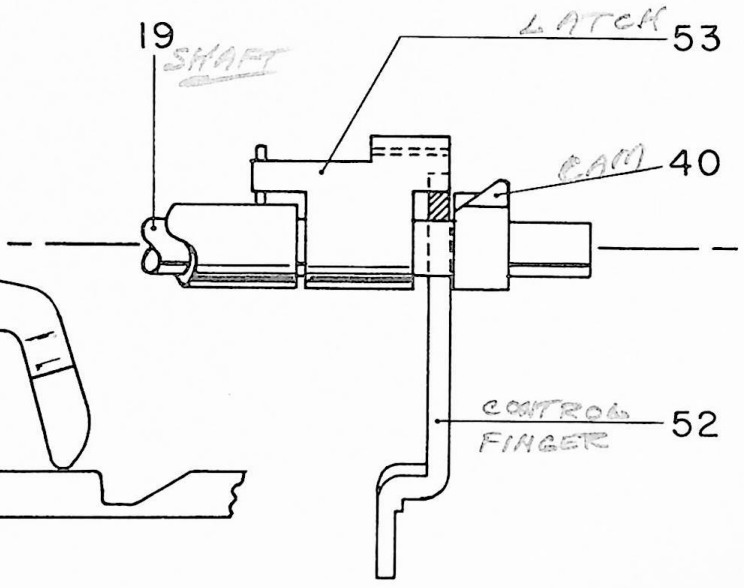
FRONT VIEW

(UNLATCHED)



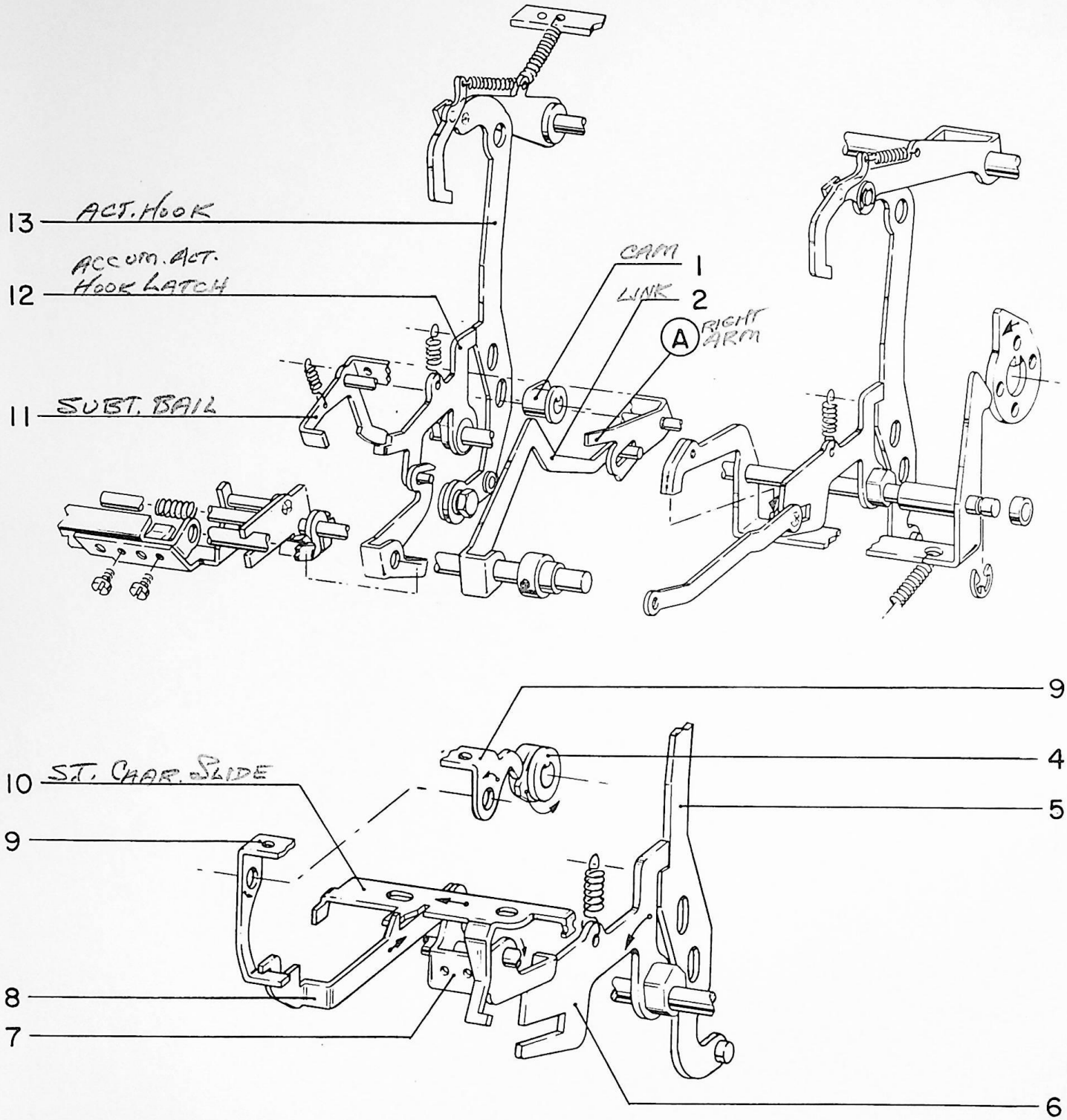
RIGHT SIDE VIEW

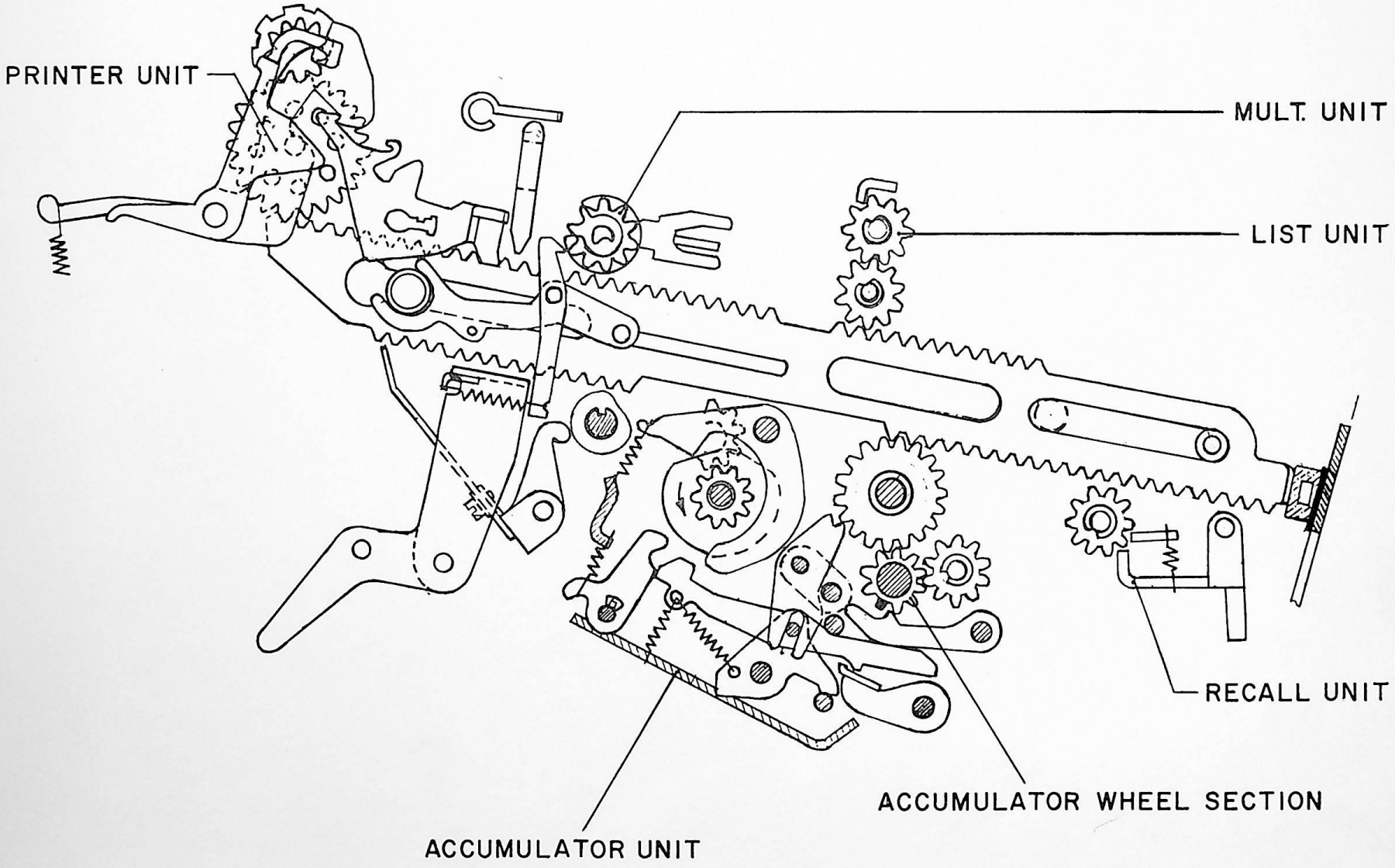
(UNITS RACK ACTUATED)



FRONT VIEW

(LATCHED)


13 ACT. HOOK
12 ACCUM. ACT. HOOK LATCH
11 SUBT. BAIL
CAM 1
LINK 2
A RIGHT ARM
10 S.T. CHAR. SLIDE
9
8
7
9
4
5
6


PRINTER UNIT
MULT. UNIT
LIST UNIT
RECALL UNIT
ACCUMULATOR WHEEL SECTION
ACCUMULATOR UNIT

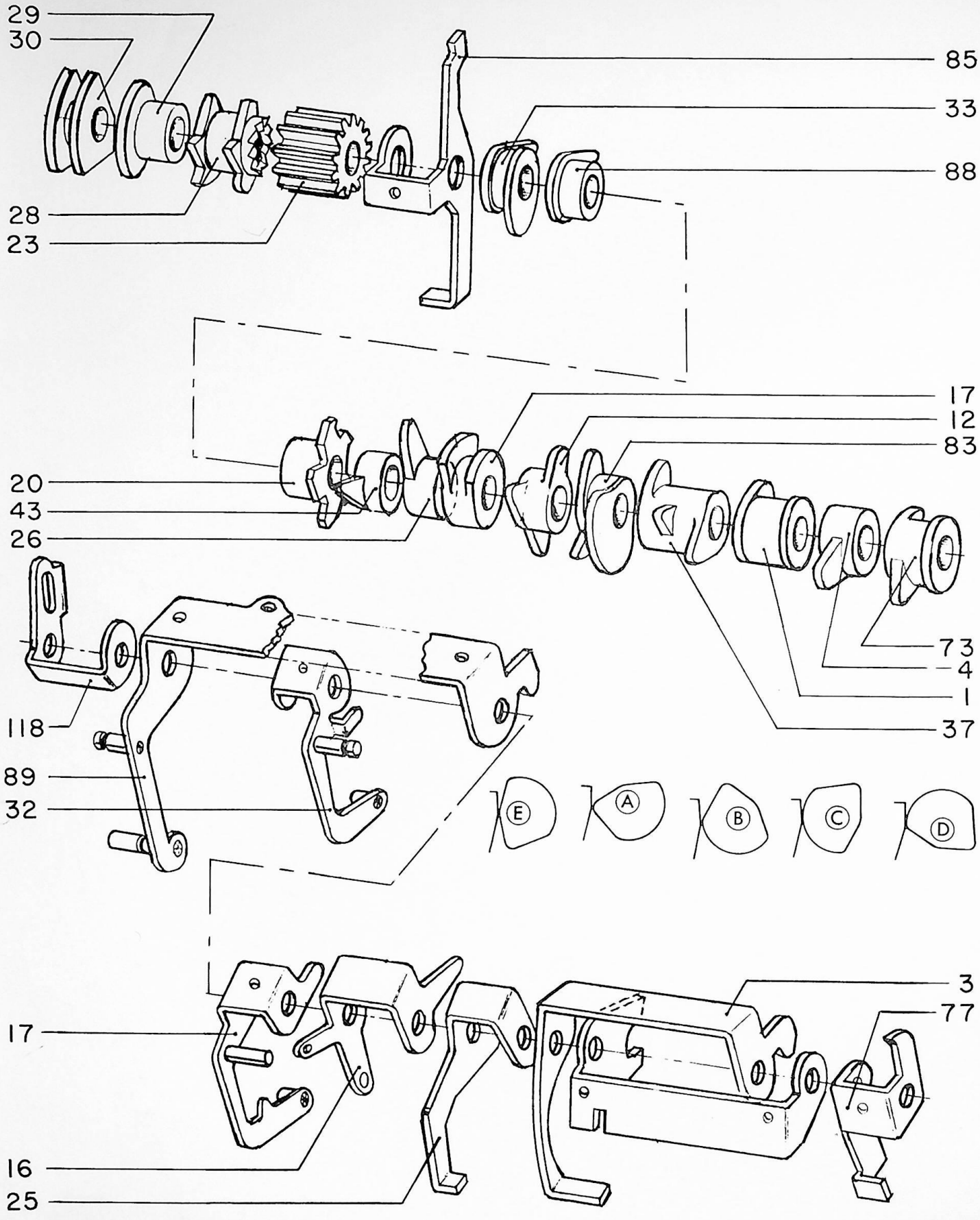


PLATE 18 UNIVERSAL CAMS and YOKES

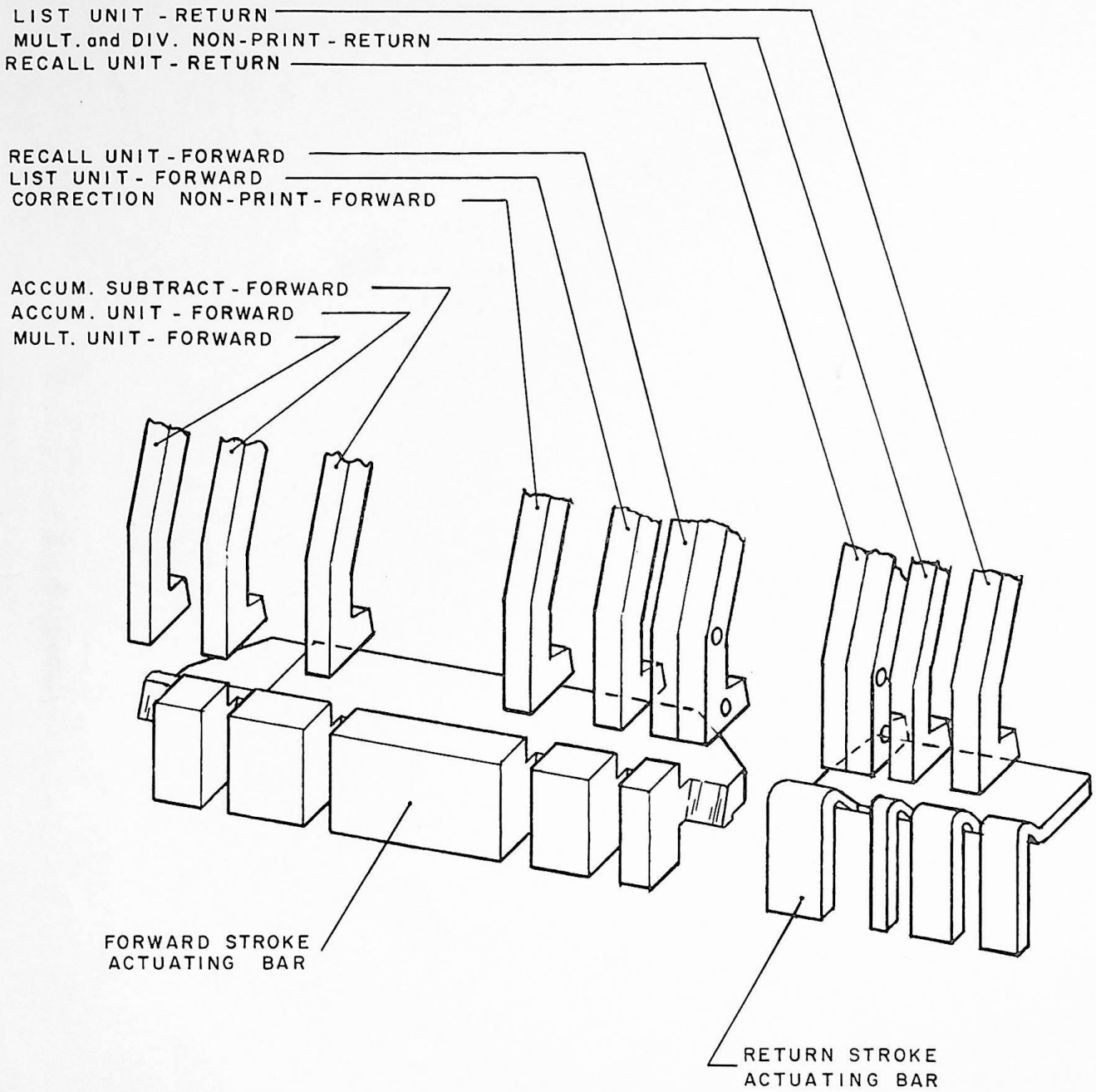
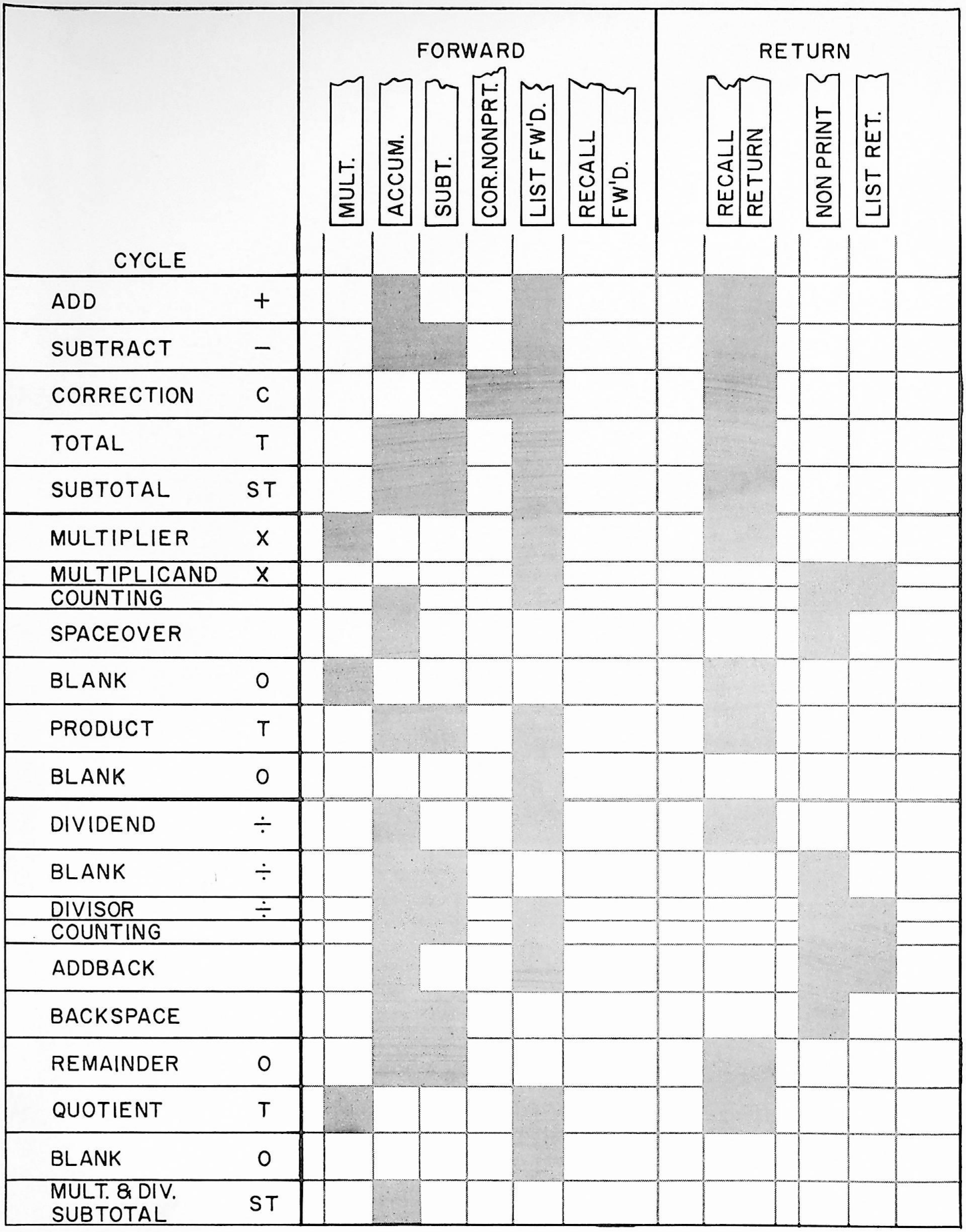

LIST UNIT - RETURN
MULT. and DIV. NON-PRINT - RETURN
RECALL UNIT - RETURN
RECALL UNIT - FORWARD
LIST UNIT - FORWARD
CORRECTION NON-PRINT - FORWARD
ACCUM. SUBTRACT - FORWARD
ACCUM. UNIT - FORWARD
MULT. UNIT - FORWARD
FORWARD STROKE ACTUATING BAR
RETURN STROKE ACTUATING BAR

PLATE 19

ACTUATOR HOOKS



RECALL FORWARD HOOK OPERATES IN RECALL AND STORAGE KEY OPERATIONS

PLATE 19.1 ACTUATOR HOOKS CHART

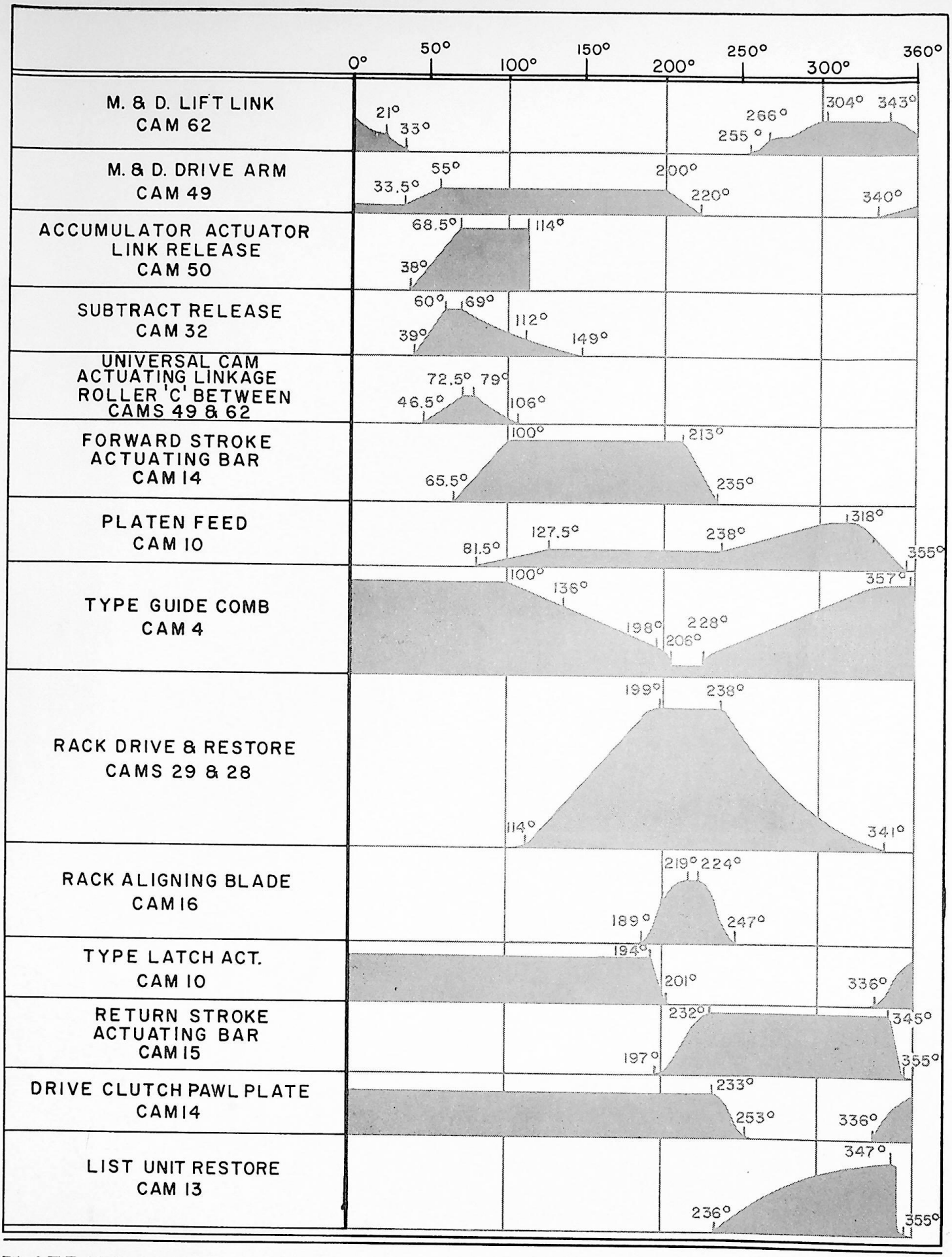


PLATE 19.2

MAINSHAFT TIMING CHART

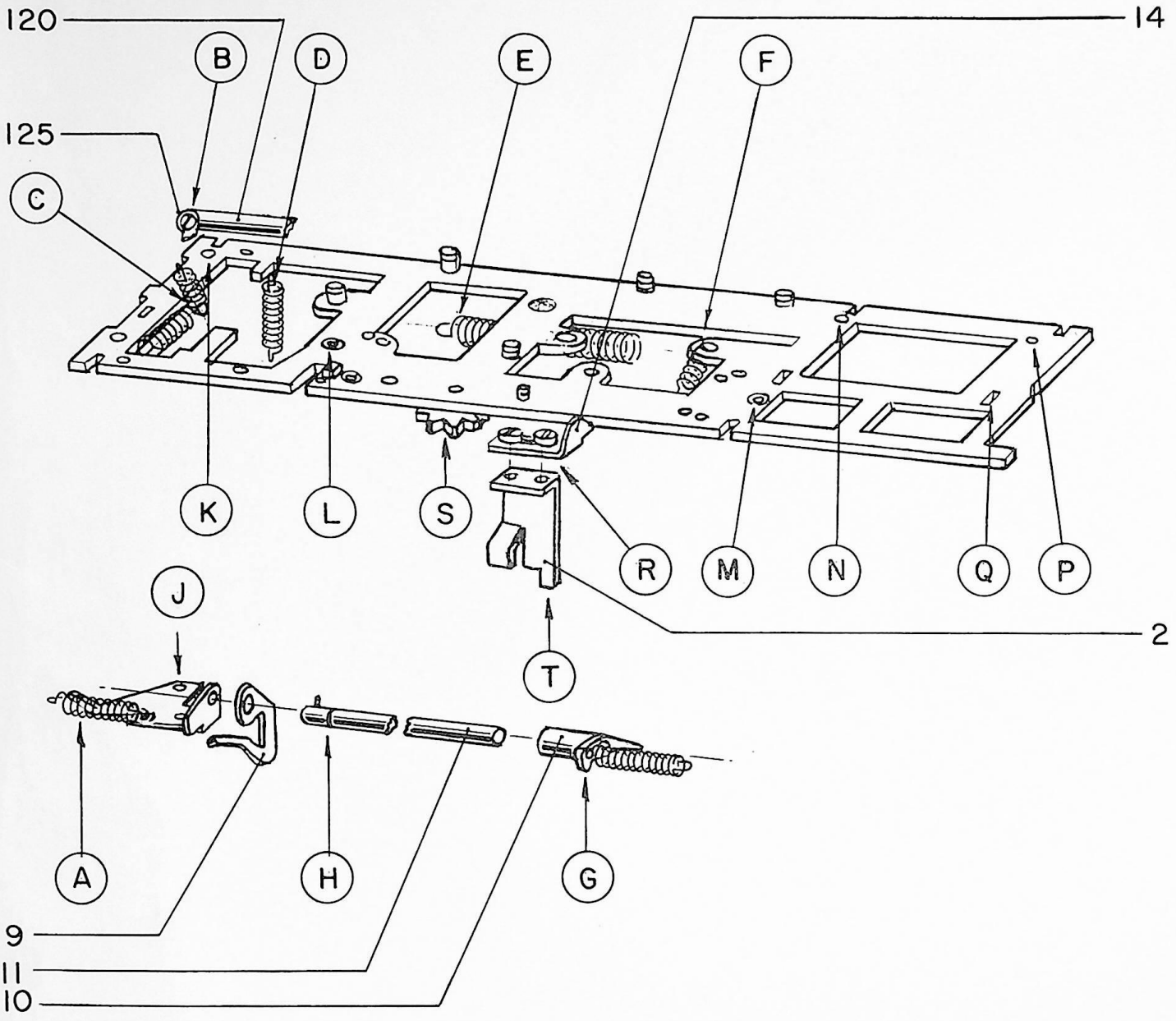


PLATE 20 TOP PLATE DISASSEMBLY

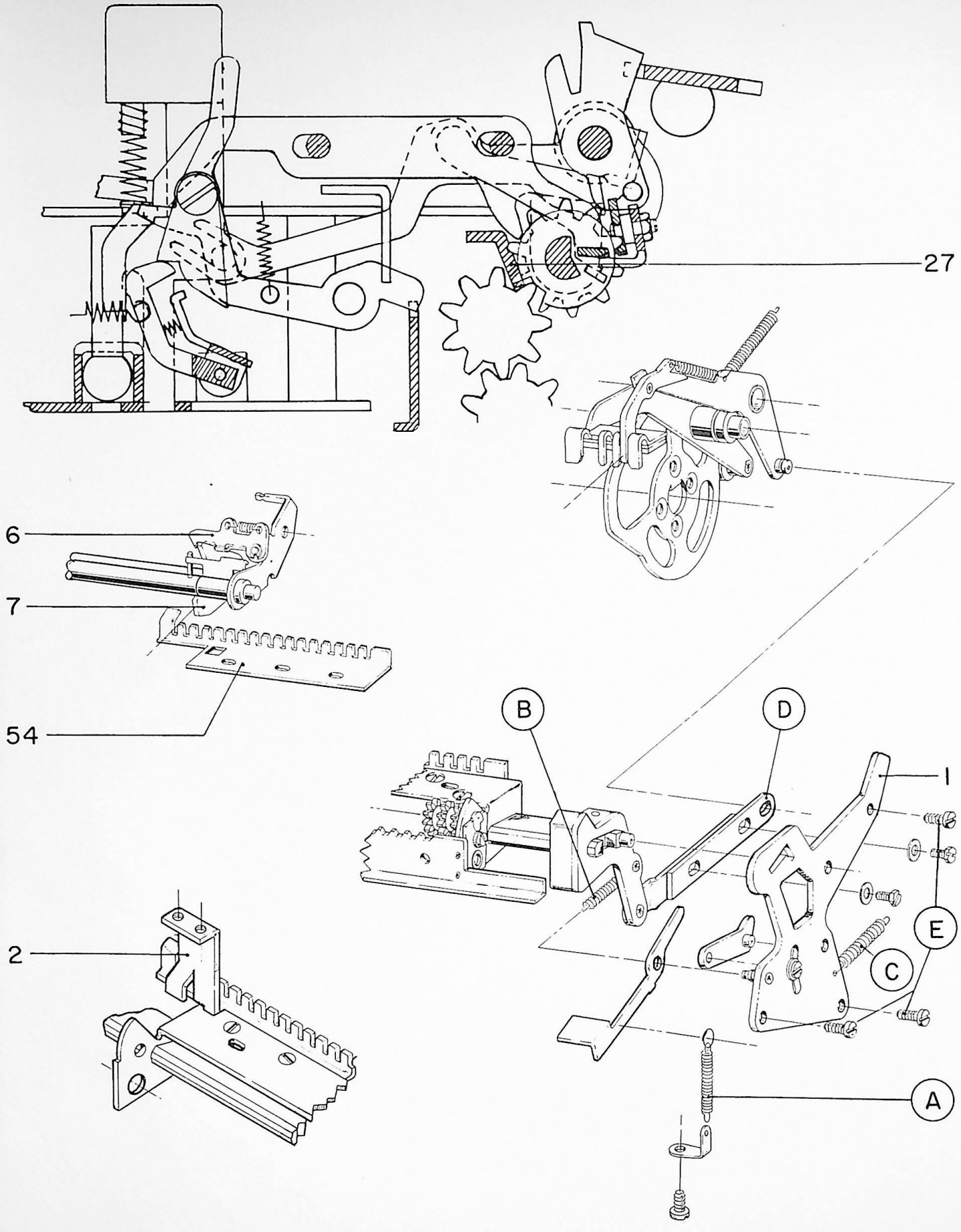


PLATE 21

LIST UNIT DISASSEMBLY

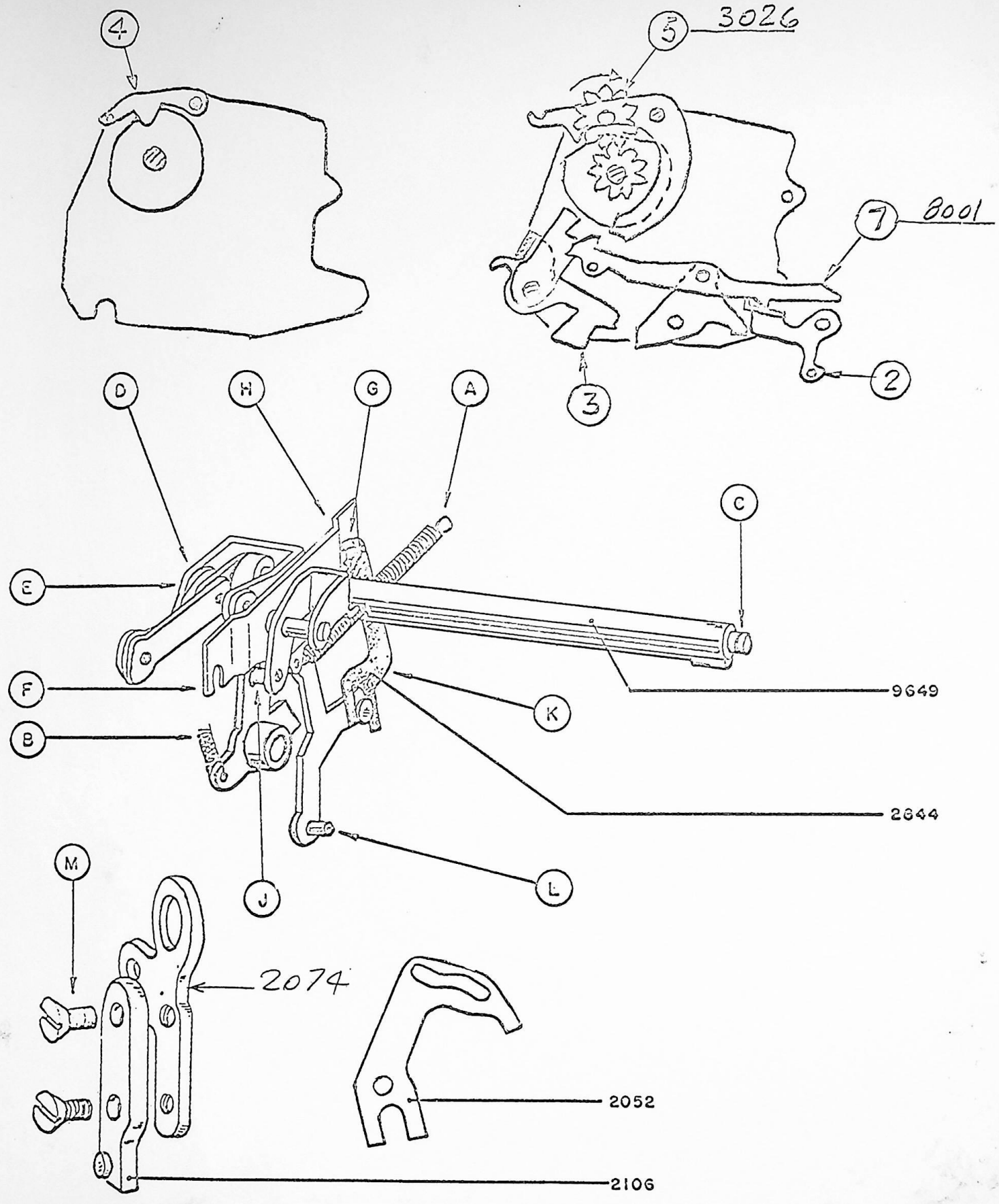


PLATE 22 ACCUMULATOR DISASSEMBLY

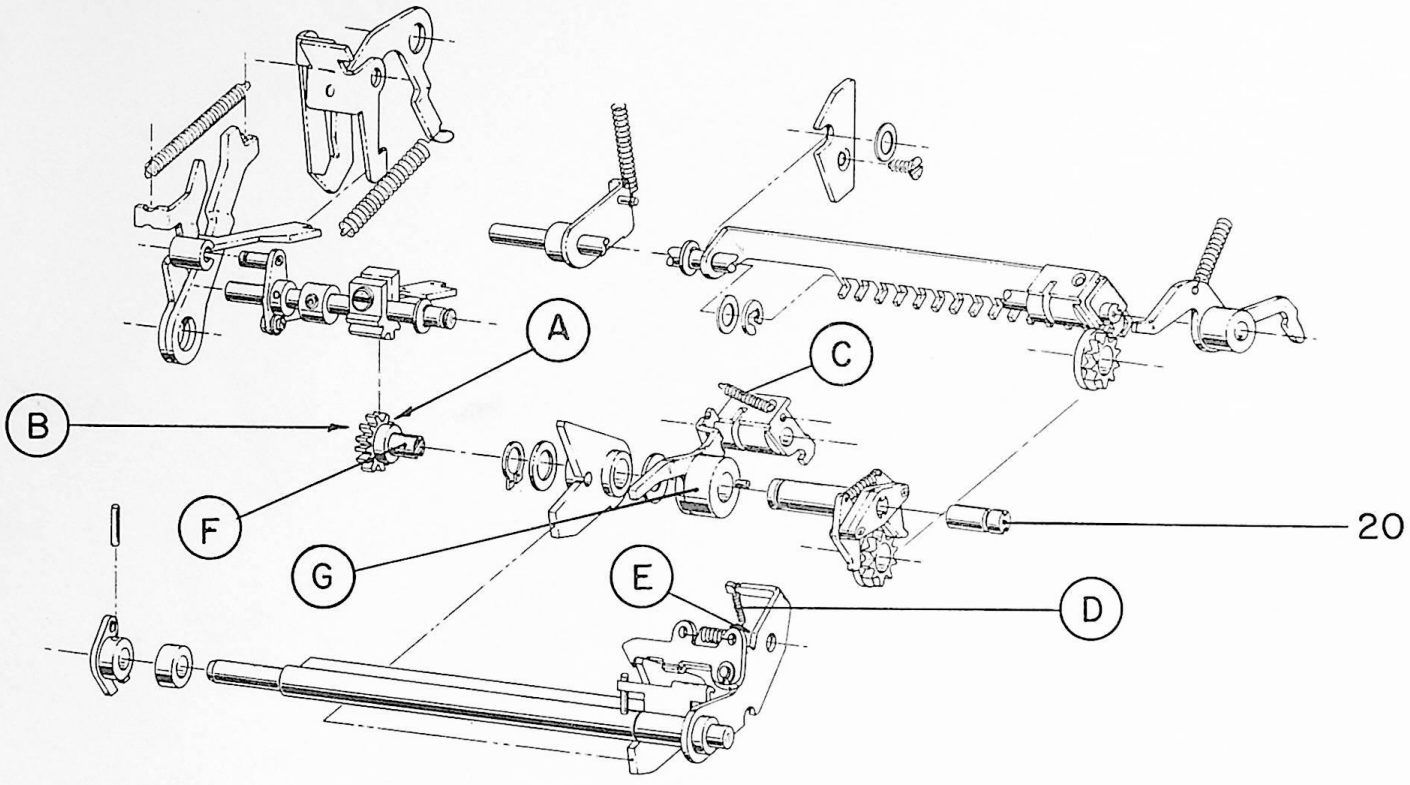
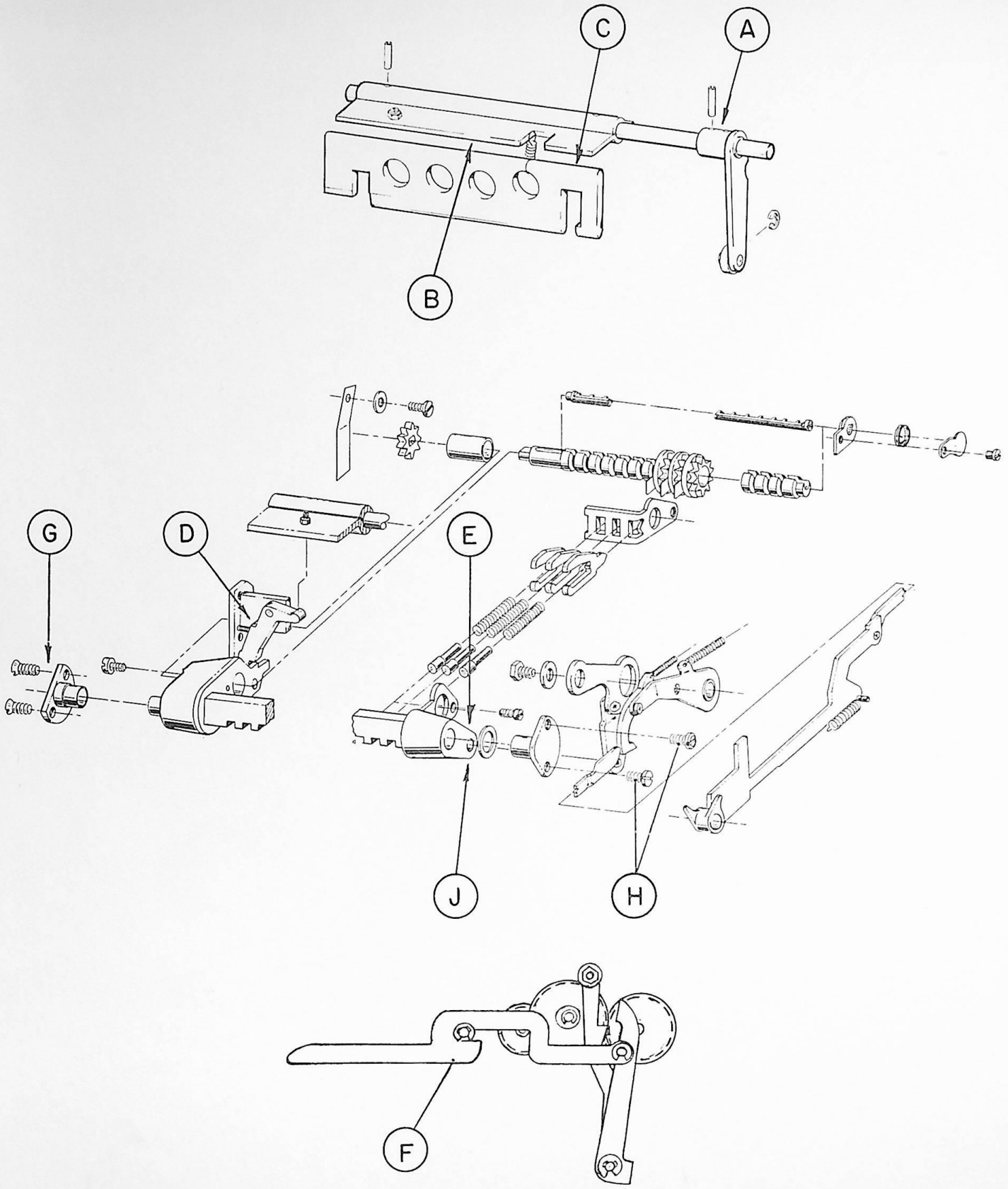


PLATE 23 MULTIPLY COUNTER DISASSEMBLY


C
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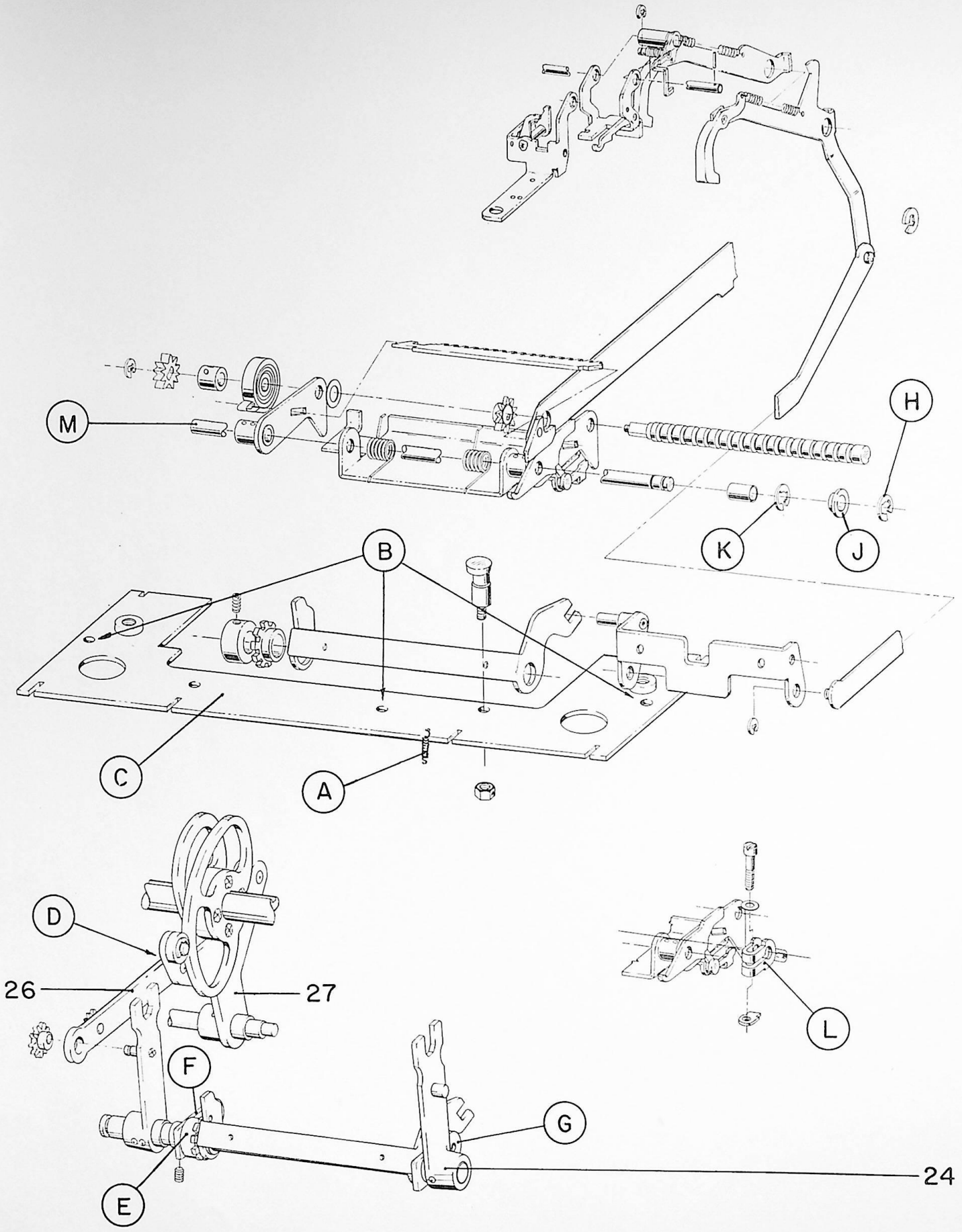
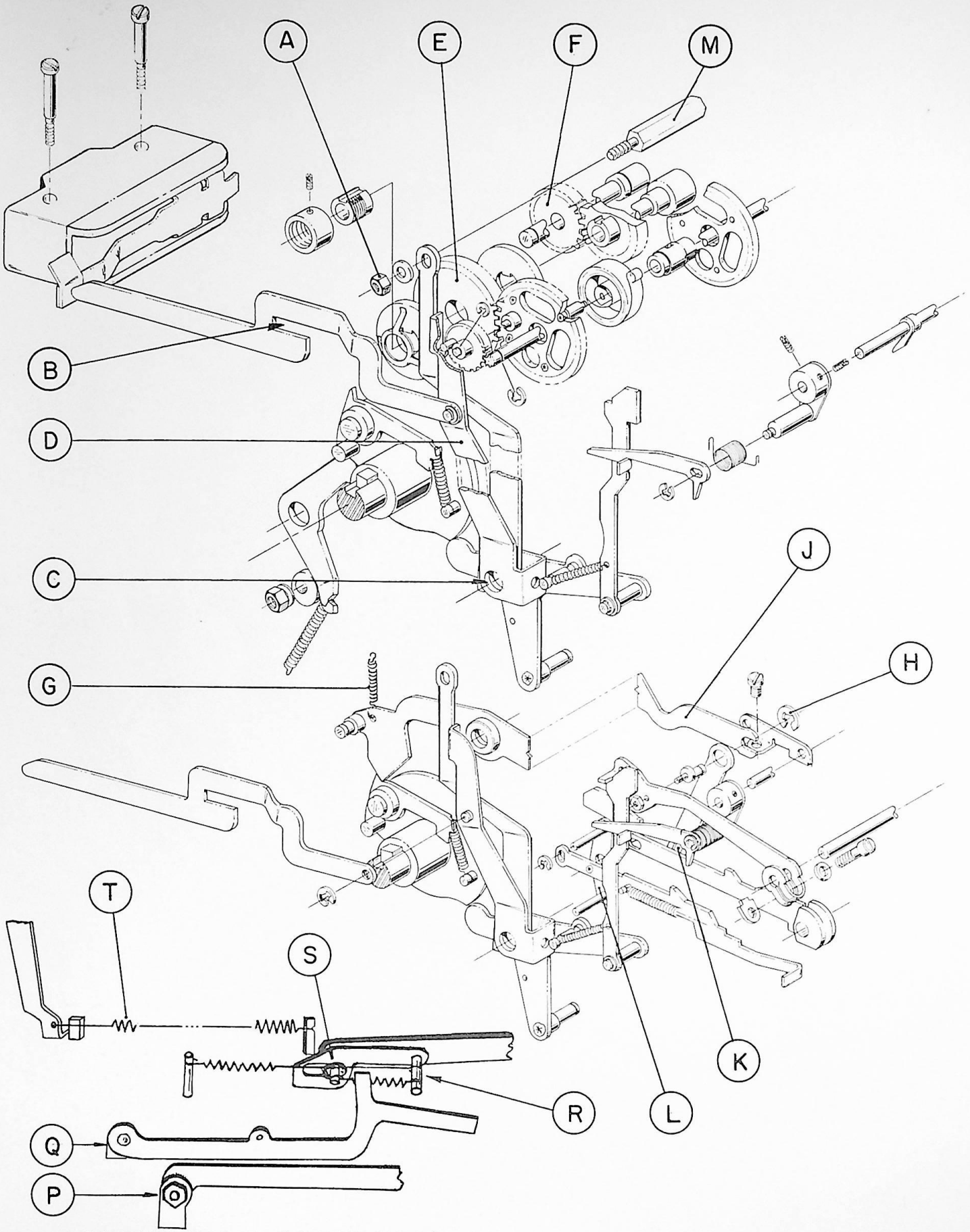
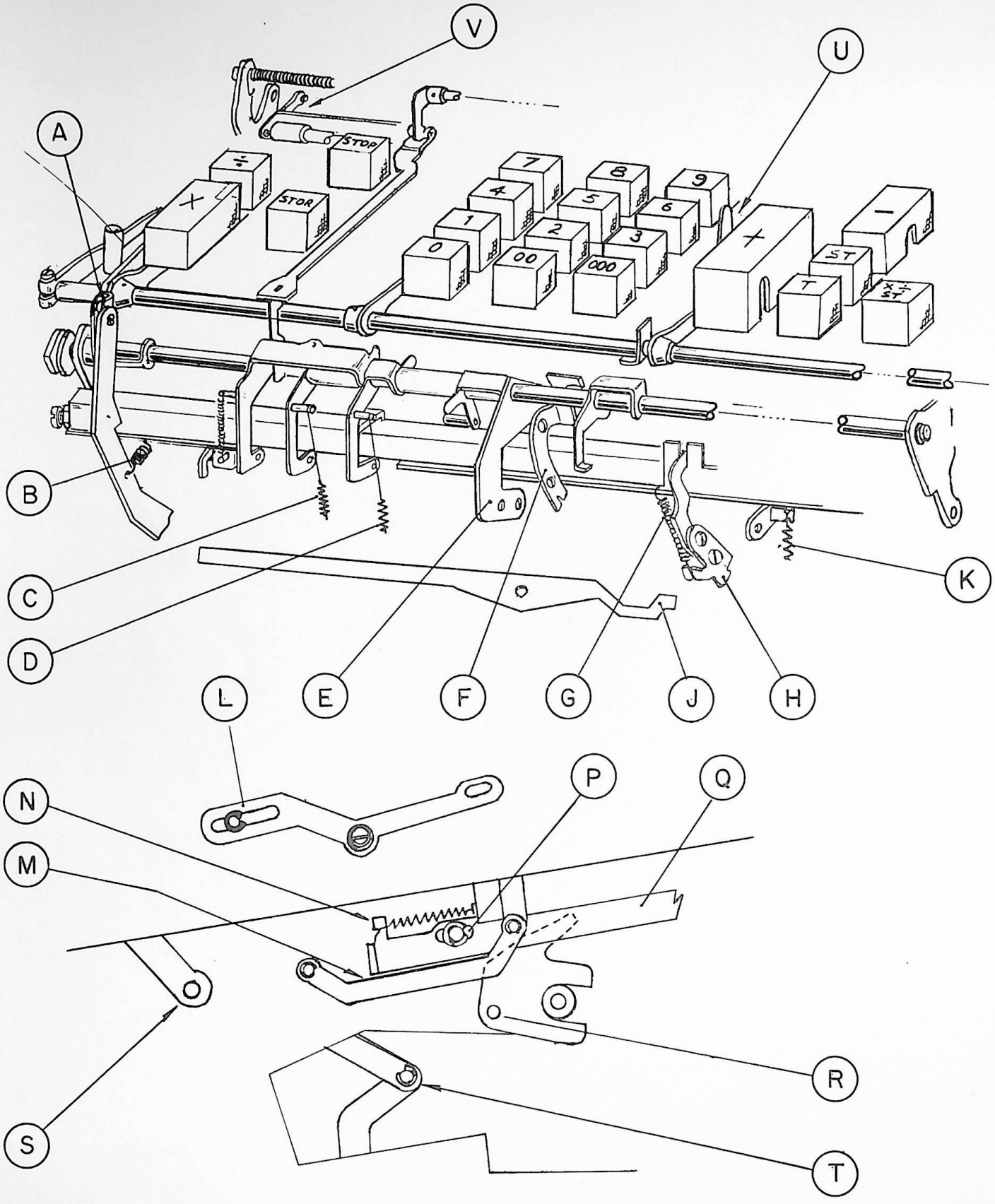


PLATE 25

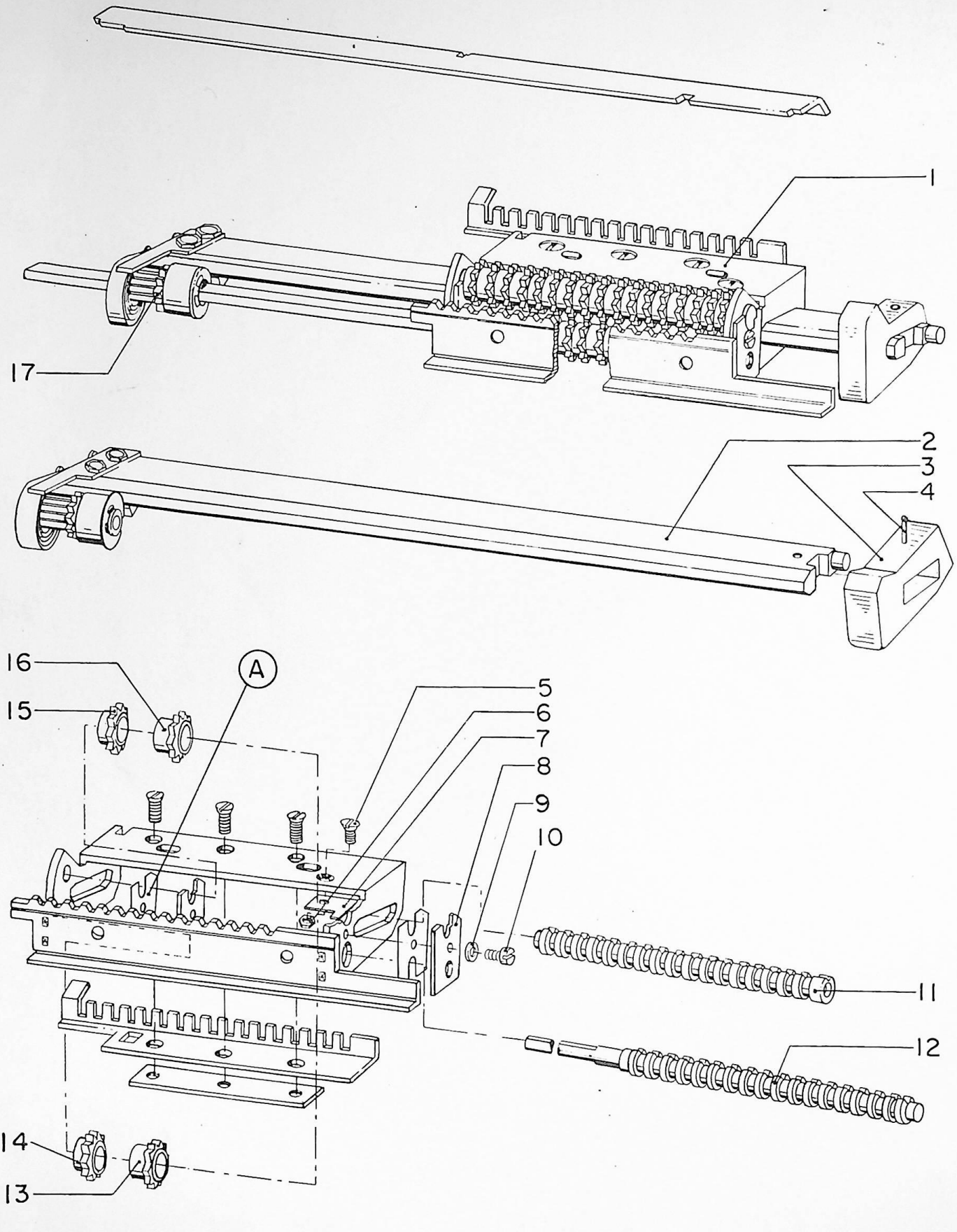
RECALL UNIT DISASSEMBLY



LEFT KEYBOARD (UNDERSIDE)



RIGHT SIDE VIEW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